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Steel Castings Without the Use of Manganese

A Product of the Small Detachable
Open Hearth Furnace—Results of
Physical and Microscopic Tests

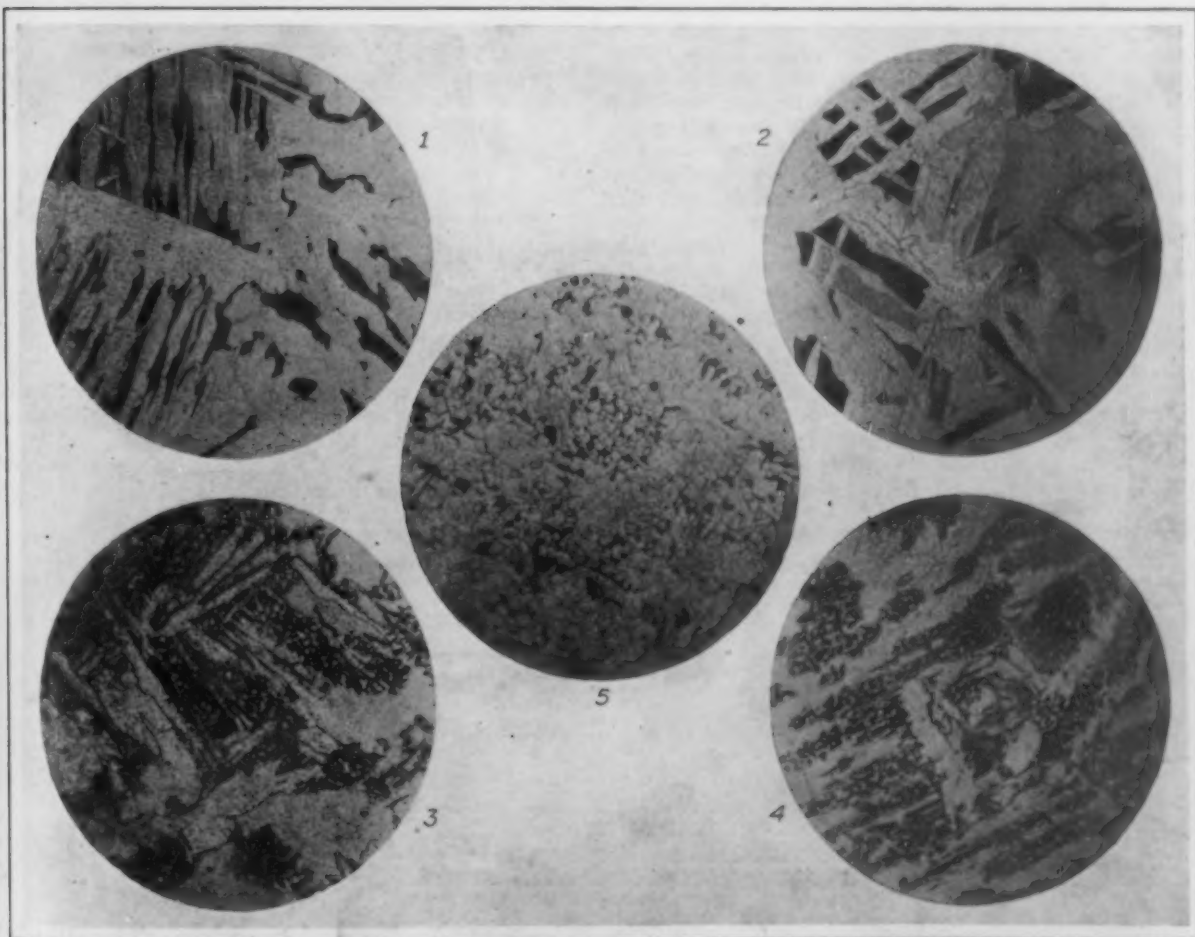
BY EDWIN F. CONE.

The production of steel castings in small open hearth furnaces has aroused considerable interest of late, and there have been a number of installations of various types to produce castings, not only of ordinary but also of special composition. Various qualities are claimed for such castings and they are active competitors with castings from the small Bessemer converter. It is claimed that not only is a metal of high temperature secured, enabling the pouring of as sharp and intricate a casting as that made from converter steel, but a metal contaminated very little with oxides and other impurities. A striking innovation in the small open hearth line is the Carr detachable open hearth furnace of two tons capacity per heat, a description of which was given in *The Iron Age* of March 21, 1912. Its

salient feature is the pouring of the metal direct from the furnace into the molds without the use of a ladle, insuring less loss of heat and a greater protection of the metal.

It has been thought by metallurgists and practical steel casting men that a good carbon steel casting could be made and yet the use of manganese in the process be dispensed with. W. M. Carr, general manager of the Alloy Steel Casting Company, Wheeling, W. Va., has been working out this theory in his furnace and the writer recently secured some test bars of the metal for examination. With Mr. Carr's permission the results are here given for the benefit of those interested.

A heat of the following composition, among others, was made in the Carr detachable open hearth furnace.



Views Representing About One-Third Reduction of Photomicrographs at 87 Diameters. Specimens Etched in Nitric Acid

	1	2	3	4	5
Tensile strength, lb.....	61,220	61,530	65,000	65,480	61,500
Elastic limit, lb.....	39,800	.....	43,000	41,620	34,500
Elongation, per cent in 2 in.....	16	21	25.5	24	32
Reduction of area, per cent.....	18.8	22	35.7	33	58.6
Fracture	Granular	Granular	Granular	Irregular	Cup

	Per cent.
Carbon	0.21
Manganese	Trace
Silicon	0.436
Sulphur	0.035
Phosphorus	0.063

The heat was manipulated in the usual way, except that no manganese was added. The sulphur being low in these heats made it the more possible to dispense with manganese. It was found also that castings of this composition very rarely crack. The saving in the one item of manganese is considerable. Another advantage was found to consist in the fact that there is much less cutting action on the hearth of the furnaces when manganese is absent. These castings, it is claimed, are solid and free from blowholes or occluded gases, while the metal is tough and quite ductile. The inventor of the furnace is convinced that while the use of manganese is necessary in some processes, it is not wholly so in his. A further examination of this steel was made physically and microscopically. Two tests of the steel in the natural or green state gave the following:

	No. 1 green	No. 2 green
Tensile strength	61,220 lb.	61,530 lb.
Elastic limit	39,800 lb.	.....
Elongation in 2 in.	16%	21%
Reduction of area	18.8%	22%
Fracture	Granular	Granular
Elastic limit, per cent. of tensile strength..	65.01	.....

Further tests of the metal in the various stages of its annealed condition are as follows:

	Partly annealed		Thoroughly annealed	
	No. 3	No. 4	No. 5	No. 6
Tensile strength	65,000 lb.	65,480 lb.	61,500 lb.	62,000 lb.
Elastic limit	43,000 lb.	41,620 lb.	34,500 lb.	35,000 lb.
Elongation in 2 in.	25.5%	24%	32%	31%
Reduction of area	35.7%	33%	58.6%	57.3%
Fracture	Half gran.	Irreg.	Cup	Cup
E.L., per cent. of T.S.	66.15	63.56	56.09	56.45

Any of these tests are good and compare favorably with any regular open hearth or other carbon cast steel having the usual manganese content of 0.60 to 0.80 per cent. Especially fine are tests Nos. 5 and 6, where the metal has been thoroughly annealed by heating to above the recalcence point and allowed to cool slowly. They surpass the usual run of acid open hearth metal in elastic ratio, which usually averages 50 to 52 per cent. only. It is also noticeable that the elastic ratio of this steel in any condition is above the average.

Under the microscope the steel presents nothing unusual. I examined it very carefully for oxides and slag, and in a marked degree it was free from these impurities. It is a common impression that any steel made in a baby open hearth furnace must of necessity be considerably oxidized. But here is a steel so made and without the use of manganese as a neutralizer of oxides of iron—a steel as good in quality and properties as any other. Photomicrographs Nos. 1 and 2 represent this steel in the green or natural condition. The large crystals are probably due to the high temperature at which it was poured, these being much larger than are usually found in castings poured from the large acid open hearth furnaces. Photomicrographs Nos. 3 and 4 reveal the metal in the partly annealed condition. The outlines of some of the larger crystals

still remain and the solution of the pearlite in the ferrite is incomplete. In photomicrograph No. 5 the thoroughly annealed condition of the steel is shown, all internal strains being removed.

The possibility of producing first-class small steel castings without using manganese opens up a wide field of usefulness. There is a large demand for any method that will produce small castings economically and of first-class quality, whether of special composition or not.

A Heavy Duty Motor Truck Axle Turning Lathe

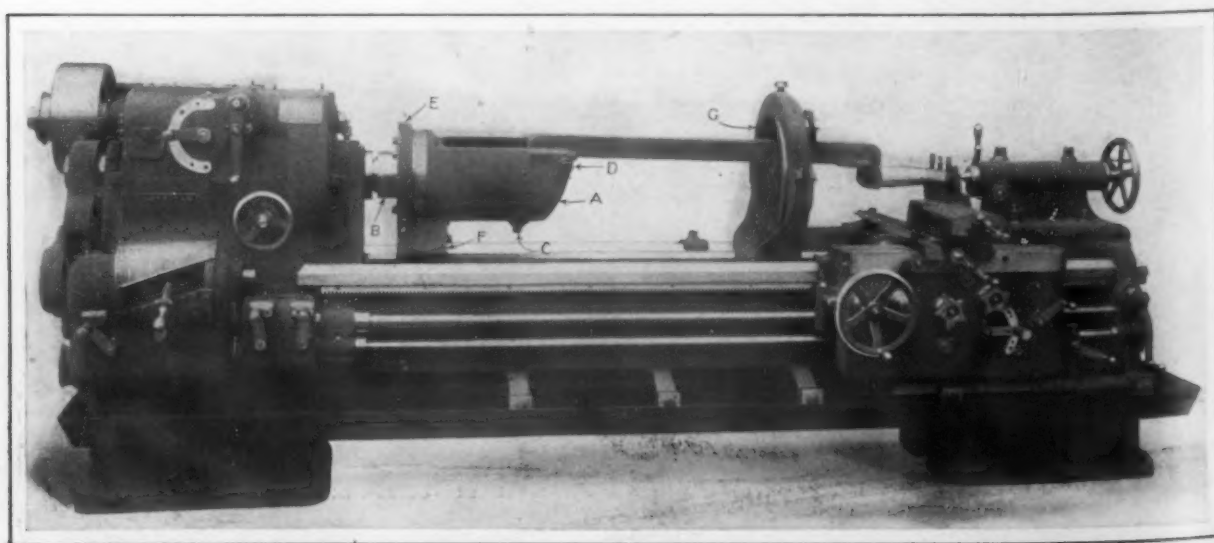
To enable motor truck axles to be machined after they have been formed or shaped, the American Tool Works Company, Cincinnati, Ohio, has brought out a new high duty lathe. The machine is designed to do away with the trouble previously encountered in machining these axles which was done while the piece was straight. After this operation was completed, a die was used to form or shape the piece and it is pointed out that here inaccurate work sometimes resulted.

The general construction of this lathe is the same as the builders' standard line, but there are some fixtures which were especially designed to enable this class of work to be handled. The eccentric chuck A is the distinguishing and most important feature of the new lathe. This chuck is fastened by heavy bolts to a removable plate, B, which is screwed on the spindle nose. A steel casting is used for the chuck which locates the axle to bring the axle bearing in line for turning. The action is similar to that of the universal chuck used on crankshaft lathes for bringing the throws into position.

The rough axle which is to be turned is mounted between centers and the chuck center H placed at the required angle to throw the end which is to be machined into the proper position. When the axle has been placed between centers, the position of an adjustable V-block is regulated by the nut C until the axle is held firmly in position. It is pointed out that this block possesses the advantage of automatically centering the axle and eliminating any tendency to twist. The screws D, one bearing on either side of the axle, act as drivers and are adjusted after the axle has been located in position. To offset the weight of the eccentric axle, a counterweight, F, which is fastened to the adjustable band E is supplied.

For steadying the work, a rotary steady rest of steel construction is furnished. While the turning operation is being performed, the axle is held in the rotor G, which rotates inside of a steel casting lined with a removable cast-iron ring. The construction of this ring is such that in case of wear it can be readily replaced by a new one without interfering with the action of the rest proper. A compression grease cup and babbitt and graphite inserts are provided for lubricating the rest.

For duplicating the position and depth of shoulders on the axle, longitudinal and diameter stops of the regular type are supplied to control the travel of the tool during the different turning and shoulder facing operations. An ordinary taper attachment can be used for turning the taper on the ends of the axle.



The New 24-In. Heavy Duty Lathe for Turning Motor Truck Axles Built by the American Tool Works Company, Cincinnati, Ohio

New Type Back-Geared Power Press

Interesting Details of the Latest Product
of the Standard Machinery Company

Ability to operate either as a direct-driven machine or as a back-geared one, is the special feature characterizing the new No. 6-B power press which has been brought out by the Standard Machinery Company, 7 Beverly street, Providence, R. I. The press is of the inclinable type and is designed for blanking, swaging and forming, especially where a very quick blow is required and not a squeeze similar to that produced by the regular type of toggle joint embossing press. The path of the ram is directly below the bearings which, it is emphasized, is an important feature in a press that is to be used for this work. When used for swaging and forming, the heavy tie rods shown are left in place, but when large sheets are to be blanked these rods which are built so that they extend on an angle from the upper bearing to the outer part of the bed can be removed. This arrangement of tie rods, it is pointed out, gives the maximum working capacity for the operator. Fig. 1 is a front view of the press and a rear view with the back gear pinion out of mesh with the large driving gear is given in Fig. 2.

As will be noticed from Fig. 1, which is taken from the balance wheel side, there is an adjustable knockout that is actuated by an eccentric rod connected to the slotted disk on the end of the crankshaft. This knockout is adjustable on the end of the crankshaft and is used for forcing out the swaged material from below. There is also an adjustable bar below the bed for this knockout. There is a second knockout in the ram of the press, which is actuated from a special knee on the rear of the frame and operates through a slotted hole in the rear of the ram.

From an examination of Fig. 2 it will be noticed that the pinion is at the extreme end of the shaft and out of mesh with the driving gear which is 4.4 times as large. When the pinion is in this position the machine will be driven directly from the 32-in. tight and loose pulleys. The diameter of the gear guard is slightly larger than the outside diameter of the pinion and draw rods are inserted in the holes in the pinion to draw it out. An adjustable collar sliding along the shaft retains the pinion in mesh after pushing it back for the purpose of driving

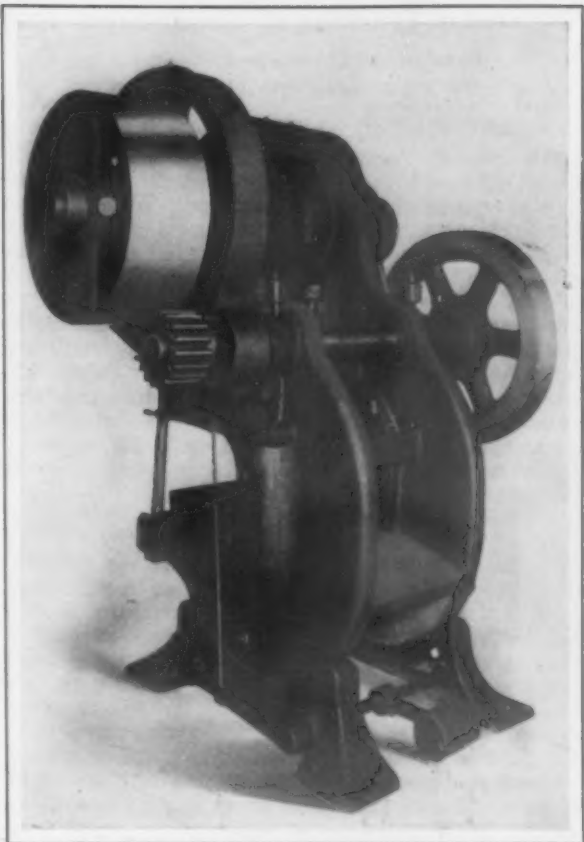


Fig. 2—Rear View of the Press Showing the Back Gears Thrown Out of Mesh

the machine through the balance wheel which is 36 in. in diameter and weighs 900 lb.

The press is fitted with the builder's standard instantaneous roller friction clutch, the diameter of the ring fitted into the driving gear being 13½ in. The crankshaft, which is fitted with a leather lined brake, is a nickel steel forging of liberal proportions, the diameter of the wrist pin being 5¼ in. The bearings are 5¼ in. in diameter and 8 in. long. Gun iron is used for the 42-in. driving gear which is of heavy cross-section. There is an extended hub on which the tight pulley is keyed, the loose pulley running on the crankshaft which is turned to a diameter of 4 in. on the end. Forged steel is employed for the pinion. The upper connection is of iron and the lower or ball connection is of forged steel threaded into the upper one with an effective means of clamping an adjustment. In Fig. 1 there will be noticed four studs, which go inside of bronze bushings and are threaded through to the rear of the connection. To tighten the upper connection after an adjustment is made, the studs are turned, forcing the bronze bushing against the thread in the steel lower connection. The bottoms of these bronze bushings are threaded at the same time that the thread is tapped in the upper connection, an arrangement which, it is emphasized, causes the thread to fit perfectly and renders bruising of the shank of the lower connection impossible. The ball is fitted into the ram by scraping and is retained there by a large bronze shoe. It is controlled by a spanner inside of the shoe which acts as a takeup.

The ram is fitted with a 3-in. hole, which is 3 in. deep and the first knockout mentioned operates through this hole. The bed is 9 in. thick below the bolster plate.

The following table gives the principal dimensions and specifications of the press:

Stroke, in.	2
Adjustment of slide, in.	3
Size of bottom of slide, in.	13½ x 7½
Distance between slide and bolster, stroke down and adjustment up, in.	9
Distance from slide center to back, in.	8
Depth of bed, in.	23½
Width of bed, in.	30½
Size of hole in bed, in.	10 x 10
Distance between uprights, in.	16
Speed, r.p.m.	90
Over-all height, ft.	8¼
Floor space required, ft.	6 x 5½
Weight of press, lb.	14,800
Domestic shipping weight, lb.	15,300
Foreign shipping weight, lb.	16,000

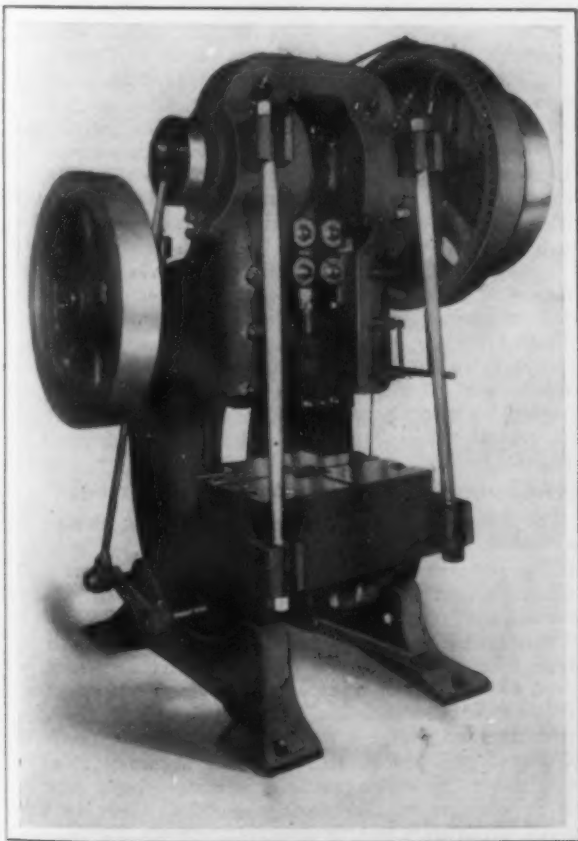


Fig. 1—Front View of the New No. 6-B Back Geared Power Press
Built by the Standard Machinery Company, Providence, R. I.

The Motor Truck as an Economical Tool

Some of the Conditions Effecting the Displacement of Horse Transportation

BY ROLLIN W. HUTCHINSON, JR., M.E.*

The economic considerations that enter into the substitution of motor truck for horse transportation in practically every line of commercial enterprise go deeper than most people would think. That the removal of horses from city streets tends to cleanliness, to sanitation and to the more efficient handling of congested traffic; that motor trucks by their greater speed and endurance, broaden their owner's selling territory beyond what can be reached by horse service; that motor operation is more economical than horse operation, all these things are recognized, in a general way by business men. That there may be a connection between the high cost of living and the high cost of maintaining horse transportation equipment is not so obvious to the casual observer, though there is ample ground for connecting the two things.

Increased Cost of Living for Horses

The evidence in this connection lies in the increased cost of living, so to speak, for horses as for human beings. It has grown simultaneously and in nearly exact proportion, for animals and for men. Accurate calculations from the actual market reports show that in the last five years the cost of feeding a horse has increased 137 per cent. A horse's feed is produced by the soil on which the food for human beings, whether grain, vegetable or flesh, must be raised. Even with the enormous acreage of unused land the United States imports each year more and more of the things that are grown in the soil, and it is plain that to reduce the cost of living for men, women and children, one of the easiest and most evident steps is to devote to producing food for them much of the acreage now, used for raising food for draft animals. This sounds theoretical and fantastic at first, perhaps, but the hard test of plain figures shows it to be practical and commonsense.

Necessity of Housing the Horse Near the Work

There is not a point at which the motor truck is not cheaper to maintain than the horse. For example: To give the highest working efficiency, a horse must be stabled near his work. Not only is the time it takes to drive him from the stable to the job just so much lost out of the working profit-units but every step of the way is taken from the distance he can travel in his day's work. A horse being flesh and blood has limited endurance. A machine, if properly built and suited to the work, has practically no limitations.

The necessity of stabling horses near their work to save both time and strength going to and returning from it, means a constantly increasing expenditure for housing. In cities, and even towns, stables frequently must be located in districts of fast-rising property values. The motor truck, on the other hand, suffering no weariness of the flesh and having from twice to six times the speed of the horse or even more, can be housed at any distance from its working base that may be desirable for economy. Furthermore, the garage is not the insanitary nuisance that the horse stable is. As a single motor truck, properly used, will do the work of 3 to 6 two-horse teams, it is fair to calculate that the motor truck equipment required for a given amount of work will occupy no more than one-fifth the floor space required for horse equipment. This allows for the space occupied by wagons, horses, feed and so on.

Obstacle in the Attitude of the Stable Master

There are other elements in load moving costs which are not so obvious. The fact that many a master of transportation began as a stable boy, became a driver and has been promoted to his job at the head of delivery and trucking service because of his knowledge of horses and how to get the most out of them puts a good many business men at a disadvantage in solving transportation problems, because their advice is not disinterested.

Neither, for that matter, is the advice of a maker of motor trucks disinterested, perhaps, in a sense. But every successful business manager knows that part of his suc-

cess is due to the fact that he has pushed the sale of his commodity, whether it is manufactured product or some kind of service, in the direction in which he knew it would absolutely make good. A motor truck concern which has proper regard for its future and its commercial standing will not advise the substitution of motor trucks for horses unless there is a certainty of their proving profitable, either by making a saving or by extending business, or in both ways.

One of the most interesting of modern commercial advisory agencies is the traffic and engineering department of the motor truck companies which have real records of the performance of different types of machines extending over a considerable period of years. It is the experience of the engineers of this organization that the master of horse transportation when he figures the expense of his department frequently overlooks or omits such items as veterinary expense, and loss of a horse's time by reason of sickness, which involves having spare animals that cannot be used economically. For instance one large concern which motorized its transportation after a searching investigation, discovered to its surprise that its wagon service was costing \$2,000 a year more than it had been reckoning on in the mere matter of veterinary advice, to say nothing of treatment or the cost of having an animal's work done for him while he is sick.

A Horse Works Half the Number of Working Days

Horses that are used carefully will not work more than 50 per cent. of the working days of the year. It is possible to get 75 per cent. of the working days out of a horse, but this is done at the expense of his endurance; he wears out more quickly. On the other hand, a good motor truck is in prime condition 90 per cent. of the time, taking out all the time lost on repairs and adjustments. And in 90 per cent. of the year's working days, the motor truck will work practically 24 hr. a day if necessary; that is to say, it has no moods, it is never half sick; when it is in commission it is up to full efficiency the whole time.

One of the minor economies of motor trucks frequently pointed out is that they do not eat when they are loafing. Fuel expense stops in a well constructed car every time the truck stops. There is no Sunday feeding, no holiday feeding; no Sunday or holiday exercising or cleaning, or other care. And while one man can look after horses, a competent mechanic, who may be a good mechanic instructed by a motor truck engineer, can give motor trucks the necessary supervision.

Another important consideration is the difference between motor trucks and horses as investments. A horse grows old every day, whether he works or not. He is wearing out with age all the time, even if he spends most of his hours in a stall. The motor truck wears only when it is in use; when it is idle there is no expense connected with it whatever, except the interest on the investment. And a horse accumulates interest on money invested in him in the same way.

Few concerns would re-equip themselves with horse transportation now. A horse that has been used in delivery or hauling service, especially on city pavements, is of little value for any other use when he is too far gone to be valuable for that. An old wagon or horse dray is absolute junk. It costs more to patch up and renew superannuated horse equipment than it does to re-equip entirely with motor trucks that will do the same amount of work.

Early Mistakes in Introducing Motor Trucks

The use of motor trucks is still a recent thing. In the very early days, mistakes were made by both the builders and owners, and some of the wrong impressions which took root then have grown and spread since. For instance, to get the most value out of a motor truck by both saving money on present delivery costs and extending the selling area of business, it is necessary, of course, to lay out the transportation system anew, making it fit the changed conditions. One truck will do the work of a horse and wagon a good deal better than the horse and wagon will do it, but it would be wastefully, because, like every other machine, a motor truck must be kept in constant motion during working hours to earn the full profit of which it is capable. Unless a business uses at least three horse wagons, it cannot use one motor truck to advantage.

*International Motor Company, Mack, Saurer and Hewitt trucks.

The amount of money involved in motorizing a business has sometimes caused hesitation, even when the management of the business was convinced of the value of motor trucks in a general way. Yet a study of actual experience shows that a good truck not only pays for itself surprisingly soon, but earns more in a short time to pay for the horse equipment it has displaced, and after that it is a steady dividend producer.

The practical and economic reasons are working together for the rapid motorizing of every business which uses transportation. The economic reasons will, naturally, be the last to be recognized; but the everyday, practical reasons are in themselves sufficiently obvious to carry on the evolution with steadily increasing rapidity. The experimental stage of the motor truck is passed. There are makes of trucks which have been in use so long and under such a variety of conditions that their performance is a fixed factor, which may be counted on absolutely. The wise business man with his skill in applying efficiency tests, and his measuring costs against profits, enables him to apply to this particular concern the technical and engineering knowledge which the expert automobile engineer will provide for him.

A New Style of Duplex Milling Machine

For use in manufacturing operations where the two opposite sides of light and medium pieces of work have to be machined true and parallel, the Garvin Machine Company, Spring and Varick streets, New York City, has brought out a new machine which is designed by the builder as its No. 2 duplex milling machine. The securing of accurate work depends upon the machine instead of on the care and skill of the operator in resetting, which, it is pointed out, can hardly always be uniform, and as two cuts are taken simultaneously, it is possible to turn out twice as much work in the same actual working time, while in addition the time consumed in setting up the work for the taking of the second cut is saved on every piece as well.

The following table gives the principal dimensions and specifications of the machine:

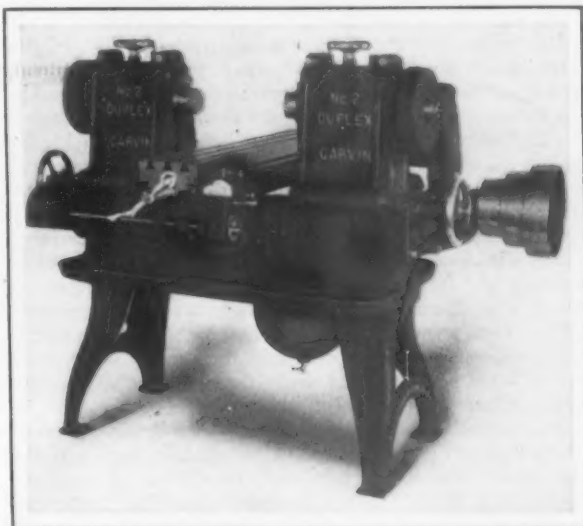
Dimensions of table, in.....	8 x 40
Length of automatic feed, in.....	24
Maximum distance between spindle ends, in.....	16½
Minimum distance between spindle ends, in.....	3½
Minimum distance between spindle and table, in.....	3
Maximum distance between spindle and table, in.....	9
B. & S. taper of hole in spindle.....	No. 10
Number of speed changes.....	3
Number of feed changes.....	12
Minimum feed per revolution of the spindle, in.....	0.005
Maximum feed per revolution of the spindle, in.....	0.125
Width of driving belt, in.....	3
Face width of countershaft pulleys, in.....	3½
Diameter of countershaft pulleys, in.....	12
Speed of countershaft, r.p.m.....	260
Floor space required, in.....	74 x 73
Domestic shipping weight, lb.....	2,465
Foreign shipping weight, lb.....	2,950
Contents of case, cu. ft.....	87

The heads have independent micrometer adjustment toward and away from each other, and the spindles are independently adjustable in a vertical plane by micrometer handwheels. In this way it is possible to adjust the cutters to the work in every direction and corners and ledges can be finished as readily as simple flat surfaces. The butt or face cutters used give a fine finish to the work and can be fed at a rapid rate without sacrificing the finish. The cutters are close to the ends of the spindles, being either on a shank or threaded directly on the spindle, which does away with the overhang and in consequence, it is pointed out, there is no scoring of the work such as is sometimes caused by the drag and spring of straddle mills.

As the heads are independent of each other, it is possible to take different shapes of cuts on opposite sides of the work, which can be stacked up and the same operation performed on a number of pieces at once. The spindles are taper and run in solid bronze boxes of the builder's standard design. The drive is by a linked train of gears from the driving shaft which runs along the rear of the bed. A cone pulley on this shaft which is backgeared in the ratio of 3 to 1, provides speed changes. The feed is driven from the driving shaft to the left end of the bed by a series of change gears. Twelve feed changes ranging from 0.005 to 0.125 in. per revolution of the spindle are provided by the gears which are all covered and are handled from below.

The table is deep and has large V slots. Its width, 9½

in., permits the work to be held in a fixture or two pieces of work secured side by side to be grooved simultaneously. An automatic trip and reverse is located in a convenient



The New No. 2 Duplex Milling Machine Built by the Garvin Machine Company, New York City

position and a quick movement by a screw ball handle of 1 in. per turn is also provided. The feed screw is driven directly by a hardened steel worm gear and tool steel worm running in an oil bath. An oil pump and reservoir are provided to take care of the work of supplying lubricant and there are extensions to catch the drip of the table.

The equipment regularly furnished with this machine includes a set of five wrenches, two arbor plungers, four change gears, a plain countershaft, an oil pump and two flexible tubes, oil shields and oil screens. In addition to the machine illustrated, there are three other sizes built, two of which are smaller and one larger. The larger machine is provided with two feed ranges, so that there are in reality five machines in all.

New Annealing Furnaces at Midvale Works

The engineering offices of Victor Stobie, Sheffield, England, refer to the adoption of the Stobie furnace for annealing tool steel bars by a number of works in Germany and Sweden. The Midvale Steel Company, Nicetown, Philadelphia, has ordered a battery of six Stobie annealing furnaces for the heat treatment of tool steel bars. The installation will be the largest in the world for this class of work, having a capacity of 7500 tons of steel bars per annum. The furnaces are producer gas fired, such gas being of low cost and under easy control.

It is stated that a feature of the Stobie annealing furnaces built abroad is the provision for long length bars. In Germany furnaces have been built for bars up to 28 ft. in length and the usual length is 16 ft. European tool steel makers are providing larger capacity annealing furnaces than formerly. The usual size now preferred is of 8 to 10 tons capacity and it is rare for less than two such furnaces turning out two to three heats per week to be working together. On the Continent Stobie furnaces have been installed with as high as 20 tons capacity per heat.

In Great Britain the Stobie electric furnaces for melting steel have been installed at a number of works. Mr. Stobie is now erecting on Tyneside a large all-electric steel works in which the furnaces will be of his design. A Stobie electric steel furnace is also to be installed at a German steel works.

The International & Great Northern Railway Company has ordered 10 locomotives and 13,000 tons of 70-lb. steel rails for laying 150 miles of track. It is also announced that the company's intention is to go ahead actively with betterments to the property by the present management in view of the fact that negotiations for the sale to the Missouri Pacific have been dropped.

Steam Accumulator-Regenerators

The Status of the Regenerative Processes for Utilizing Exhaust Steam

Reassuring observations regarding the utility of the steam accumulator-regenerator as a means for utilizing the exhaust steam from the steam engine operated under varying loads or intermittently were made at a meeting of the Engineers' Society of Western Pennsylvania held November 19, 1912, in Pittsburgh. A paper on "The Theory of Steam Accumulators and Regenerative Processes" was read by F. G. Gasche, mechanical engineer of the Illinois Steel Company, Chicago, and this was followed by a spirited discussion, which with the paper was calculated to emphasize the large place which this auxiliary of the power apparatus of the steel mill has already taken and promises to fill to even a greater extent. The paper in full, together with the discussion, was printed in the proceedings of the Society for December, and from this publication the following information has been obtained:

Mr. Gasche's paper was a mathematical investigation of various types of steam accumulators. He took up the elementary form of accumulator, consisting of a closed chamber containing iron as the chief absorbing agent, and in which the mass of iron is distributed to as large an extent as practicable to present the largest possible amount of surface exposed to steam. He then discussed the static water regenerator, in which water is employed largely as the heat reservoir, one form, it will be recalled, involving an arrangement of shallow cast-iron pans containing more or less water.

The third type of the steam regenerator he discussed was that consisting of a reservoir containing a large body of water, which is circulated by means of a pump or equivalent apparatus, capable of delivering the water at a pressure to a spray in the upper part of the chamber. In the case of this forced circulation regenerator it was admitted that the direct losses are through the actual resistance of the pump or other circulating apparatus. Finally, he took up the question of generators which induce the circulation. In these the steam to the generator enters through numerous small jets from submerged steam pipes into the body of the water within the regenerator. The application of heat below the surface of the water is held to favor the production of rapid water currents, the inducing of these currents in the way described giving the name ascribed to the regenerator.

Among other details discussed was that of receiver space preceding a regenerator, such space being of value as a heat reservoir, but it is generally advisable, he said, to put the money required for its construction into additional regenerator capacity. He concluded the paper with an enumeration of the points which may be taken into consideration in making a test of the regenerator.

The Discussion

The discussion was opened by L. Battu, president of the Rateau Steam Regenerator Company, New York City, who mentioned that quite a number of engineers have considered and still continue to consider steam regenerators as heat and storage reservoirs which have no other function than to furnish steam during periods of shut-down of mill engines. A steam regenerator, instead, is an equalizer for a flux of steam. It acts as a steam condenser in which the circulating water, being a limited mass, is alternately heated by the fact that it condenses steam and cools by evaporation when the pressure in the vessel in which condensation takes place is reduced.

Dry Steam from a Regenerator

In a properly designed regenerator, the steam discharged is dry saturated steam, and the percentage of moisture contained is always less than 1 per cent. He said that throttling calorimeters had never shown more than 0.6 per cent. moisture. The drying of the steam is due to its passage through the water of the regenerator. He spoke of the satisfactory operation of a regenerator plant at the works of the International Harvester Company, South Chicago, now known as the Wisconsin Steel Company, and of the plant installed at the Vandergrift works of the American Sheet & Tin Plate Company, described in

The Iron Age of January 7, 1909. At the latter plant, a reversing bar mill engine exhausts into a Rateau low-pressure engine, delivering some 1700 kw. without increase of fuel. "Broadly speaking," he added, "if it is considered that an ordinary reversing engine running non-condensing can by the Rateau process be made to develop 1500 kw., it will be seen that for a given amount of fuel more than twice the power is produced."

The Value of Mixed-Flow Steam Turbines

The use of mixed-pressure turbines, he emphasized, brings about results which are far reaching. A turbine to which is delivered a homogeneous flow from the steam regenerator at the rate of 60,000 lb. per hour will be capable of delivering 2000 kw. on low-pressure steam, and if this turbine is made of the mixed-pressure type, it can very easily carry more than 3000 kw. on high pressure, the difference of power being due to the power developed by the turbine in the high-pressure section. It will then be capable of taking peak loads up to 3000 kw.

J. A. Hunter, mechanical engineer of the American Sheet & Tin Plate Company, mentioned both the early and the later installations of regenerating apparatus. The first consists of a 500-kw. low-pressure turbine and a Rateau regenerator 40 ft. long and 8 ft. in diameter, with a capacity of 90,000 lb. of water at normal water level, receiving the exhaust from a 45 x 72-in. reversing mill engine. A back pressure of 3 lb. is maintained on the system by means of a relief valve set to blow at that pressure. A test of the regenerator showed that it would supply a sufficient amount of steam to operate a 500-kw. turbine at rated capacity for a period of 2 to 3 minutes. The recent installation includes two 500-kw. mixed-flow turbines and an additional regenerator 50 ft. long and 9 ft. in diameter, with a capacity of 126,000 lb. of water at the normal water level. The regenerators have been arranged so that they may work in parallel, and when the installation was made, the exhaust from two 44 x 48-in. bar mill engines and several hydraulic pumps was added to the system. All of the exhaust steam is first passed through the oil separator of a feed-water heater, a sufficient amount of steam being retained in the heater to heat the boiler feed water. The remainder passes on to the regenerator and through the relief valve, if there is a surplus.

Faulty Performance of Regenerators

Prof. W. Trinks, professor of mechanical engineering of the Carnegie Institute of Technology, Pittsburgh, explained that in several plants he had watched, the relief valve blew practically every time the reversing engine pulled a heavy load, and immediately afterward the live steam valve would open to the turbine, proving that steam absorption of the regenerator had been far from perfect. He mentioned a plant where the regenerator capacity was doubled after starting in the vain hope of doing away with these losses of exhaust steam. His point was that steam does not flow to the accumulator in a steady stream, but comes in puffs and gulps. "This passage of steam," he continued, "occurs with the violence of an explosion, and the valve must be capable of opening and closing its full travel many times each minute without pounding itself to pieces. Some of the valves required are over 36 in. in diameter, with moving parts the weight of which may reach as high as 1000 lb. and must oscillate up and down with a travel of some 6 in. or more for 25 or 30 times a minute." He dwelt on this and other points more, however, to suggest that some of the variables in the mathematical discussion of the author had been overlooked when they might be sufficiently important to affect his results. He was also inclined to take with some caution the statement that the regenerator delivers steam with a practical absence of moisture. He felt that rapid evaporation means moisture carried with the steam, and referred to some tests published by Dr. Puppe, in *Stahl und Eisen*, in which moisture amounting to 24 per cent. was found in the steam delivered to the turbine, in spite of a large regenerator capacity.

Performance of Regenerator Plant at Ensley, Ala.

F. G. Cutler, steam engineer of the Tennessee Coal, Iron & Railroad Company, Ensley, Ala., called attention to the fact that Mr. Gasche's paper brought out that the

capacity of a regenerator should be based on its capacity to absorb heat at high rates in relatively short periods rather than by its capacity to give off heat in time of deficiency over periods of 2 to 5 min. He referred briefly to some of the experiences of the No. 2 powerhouse of the Ensley plant, in which there are three 3000-kw. mixed-pressure turbines deriving their low-pressure supply mainly from two Mesta 55 x 66-in. twin reversing engines, driving a 44-in. blooming mill and a 34-in. roughing mill. The exhaust from these two engines is extremely variable on account of the stopping, starting and reversal of the engine every few seconds, and the variation of work in each pass.

As shown by continuous indicator cards the engines are each exhausting at the rate of over 300,000 lb. steam per hour for short periods, while the average steam from each engine while rolling at an average rate is less than 100,000 lb. per hour, and in spite of this wide fluctuation in supply of exhaust steam, the five regenerators furnish the turbines with a steady supply of low-pressure steam without loss at the back-pressure valve, although the regenerators have not capacity enough to supply the low-pressure turbines with a full supply of steam over a period of 2 minutes.

There are periods, he admitted, when the supply of exhaust steam is greater or less than that necessary to operate the station, and at these periods there is either exhaust steam wasted, or live steam used, to make up the deficiency, but these do not both occur at the same time.

The turbines are operated almost exclusively on low-pressure steam when the mill is in operation and when the mill is shut down high-pressure steam is utilized that would otherwise have been wasted at the safety valves, although at no time is the back pressure on the engine carried above about 4 lb. gauge, and as these engines were operated non-condensing, the resulting power is obtained at practically no expenditure for fuel. The regenerators are of the induced circulation type and the size was determined by an investigation of the mill engine operation by the aid of continuous indicators and a graphical plotting of an average mill cycle, from which the most economical capacity was calculated.

Mr. Battu, in referring to the remarks of Professor Trinks, said that in the well-designed regenerator the relief valve will only open when the average amount of steam discharged by the mill engine is in excess of the low-pressure turbine requirements and after the regenerator had absorbed the maximum amount of exhaust steam; that if the low-pressure turbine requirements are less than the average amount delivered by the mill engine, it is self-evident that the valve must open and discharge the excess. He also emphasized that mixed-pressure turbines are capable of enormous overload conditions. He held that Professor Trinks had been unfortunate in witnessing the operation of plants in which the regenerators were not properly installed or proportioned.

The paper was also discussed at length by R. S. Younglove, assistant mechanical engineer of the Illinois Steel Company, South Chicago; C. J. Bacon, steam engineer of the Illinois Steel Company, Chicago; D. Eppelheimer, chief engineer American Rolling Mill Company, Middletown, Ohio; J. N. Chester, consulting engineer, Chester & Fleming, Pittsburgh, and E. D. Dickinson, turbine engineering department of the General Electric Company, Schenectady, N. Y.

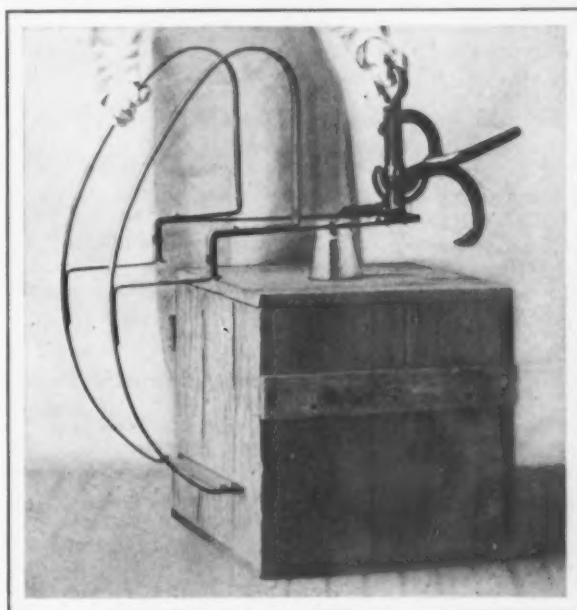
The Laughlin-Barney Machinery Company, Union Bank Building, Pittsburgh, has received an order from the Crucible Steel Company of America for the installation of an inverted type drilling machine in its Crescent works, Pittsburgh. This type of machine is an innovation in heavy duty drilling. The drills are forced upward, and the machine is designed to drill $\frac{3}{4}$ to $1\frac{1}{2}$ -in. holes from 12 to 22 in. in crucible steel sections. The Laughlin-Barney Company has also taken orders for a number of Newton machine tools, including five large cold saw cutting-off machines and several rotary planers for installation in the Pittsburgh district. It has taken the account and has been made exclusive agent in the Pittsburgh district for the Foote-Burt Company, Cleveland, manufacturer of a full line of high-duty multiple gang and arch-bar drills and special drilling equipment.

An Interesting Safety Device for Tilting Carboys

A recent contribution to the safety devices now on the market is the Flaherty carboy inclinator, which has been brought out by the Carboy Inclinator Company, 1269 Broadway, New York City. The device is intended to eliminate the danger which has heretofore existed in the carboy's falling and breaking, thus injuring the workman by covering him with the dangerous liquids which are used in some manufacturing lines. To use the device, it is not necessary to raise the carboy from the floor, and this reduces the amount of effort required to handle the carboy. Finally it is claimed that the inclinator is safe against spilling or splashing.

As will be noticed from the engraving, the device consists of a set of curved rockers, a handle for clamping it in position on the carboy case and teeth for holding it securely in position. The inclinator is made of iron throughout, malleable castings being used. For convenience in shipping, the inclinator can be taken apart in a few minutes and as readily reassembled.

The inclinator is slipped over the carboy as shown in the engraving so that the flat strip at the left rests against the side of the case almost at the bottom. The straight



A New and Interesting Device by Which Acid Carboys Can Be Tilted Safely Made by the Carboy Inclinator Company, New York City

lever at the right is then thrown over through an arc of almost 180 deg. so that it is approximately parallel with the top of the carboy case and is at the opposite side of the handle. This clamp works with a cam action and forces the prongs shown just above the top of the case at the left into the wood while the hook at the right is forced into the opposite side and the inclinator is securely fastened in position. After this has been done, a slight pull on the handle, which is grasped in the man's left hand, places the carboy on the rockers and it can be tilted to any desired position. The case is of course tilted more and more as the level of the liquid falls, until finally the carboy is inverted with the neck in a vertical position and the inclinator rests on the curve shown at the upper end. As soon as the liquid is all poured off, the carboy is returned to an upright position by a pull on the handle. If it is desired to use only a portion of the liquid at a time, it is a simple matter to bring the carboy back to the upright position. The inclinator is then removed from the case and attached to another one in the same way.

The Roanoke Bridge Company, Roanoke, Va., is breaking ground for an addition of 54 x 150 ft. to its present shop, which will increase its capacity to about 10,000 tons per annum. The branch offices of the company are located at Atlanta, Ga., Rock Hill, S. C., and Burlington, N. C. It is doing a general line of concrete substructure work, as well as steel work.

A New Portable Electric Drilling Machine

In addition to the $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{5}{8}$ in. portable electric drilling machines which were illustrated in *The Iron Age*, July 25, 1912, and January 9, 1913, the Standard Electric Tool Company, Cincinnati, Ohio, is building a $\frac{3}{8}$ -in. machine equipped with a screw feed. This machine is designed for use on direct-current circuits and is characterized by a very rigid construction, the development of high power and the use of ball bearings throughout. The motors used are of the series type and have the insulation of the windings impregnated by a special process. Case hardened chrome-nickel steel gears which are supported at both ends and run in grease are employed to transmit power.

A similar size of machine has been added to the line of alternating-current drilling machines. The mechanical construction of this style is simple and rigid and the electrical connection has been simplified to such an extent that the drills are practically fool-proof. They are designed especially for hard, continuous service. These machines can be connected to a lamp socket and will run without special attention.

A special feature which is emphasized is that the motors are non-racing. That is, the machine does not race when operating under a light load or idly, thus preventing the armature of the motor from burning out. A quick make and break switch gives the operator control of the drill at all times.

As compared with the last previous machine built by the company, which was illustrated in *The Iron Age*, January 9, 1913, this new machine has a screw feed by which the machine can be rested against a wall or other support and the drill point fed into the material by turning a wheel. The chuck used on the earlier machine was operated by the insertion of a square key, but in the new machine it is of the self-tightening type and is operated by the fingers.

A Profiling Machine with an Automatic Feed

A new automatic profiling machine has been built by the S. E. Spafford Machine Company, Hartford, Conn., for its inventor, Charles R. North, of that city. Two cams impart longitudinal motion to the work table and lateral movement to the head carrying the cutter spindles. Fig. 1 is a view of the machine itself, and Fig. 2 illustrates the cam arrangement.

While the path of the cutter on the work is determined by the cams shown in Fig. 2, so that sufficient accuracy would be possible, they act in conjunction with the former pin of the cutter head and the forming block of the work table. The cam adjacent to the work head controls the cross-drive of the cutter spindle by a crank lever, while the cam at the rear drives the work table through a connecting rod. The elasticity required in the connection between the cams and the work head and the table is provided by springs. The camshaft is driven by a worm and

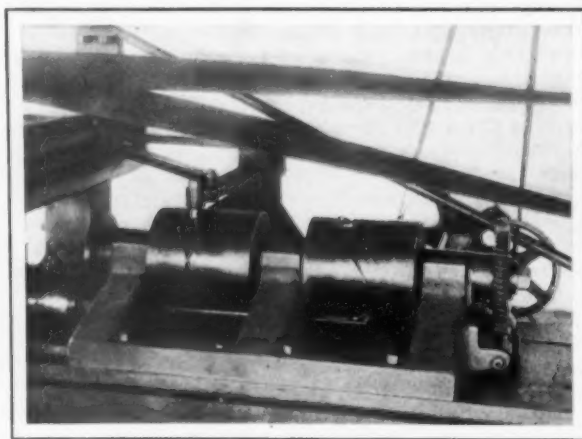


Fig. 2—View of the Cams Which Impart Longitudinal Motion to the Table

worm gear, a clutch permitting the drive to be engaged and disengaged at will. The clutch trips automatically when the work on a blank has been performed. Adjustment of the forming pin to the required depth of cut is secured by tapering the pin.

No Tonnage Tax on Lake Ores

MARQUETTE, MICH., February 22, 1913.—There will be no tonnage tax on the iron mines of either Michigan or Minnesota. This has been made clear by the action of the lower houses of the legislatures of both States. At Lansing, Mich., Representative Burns presented the proposition in inviting form. His resolution merely proposed an inquiry into the conditions surrounding the industry to ascertain whether the manufacture of iron and steel products in Michigan could not properly be encouraged by the imposition of a tonnage tax on ore that was not consumed in the State. What Mr. Burns had in mind, he explained, was legislation that would make Michigan a greater beneficiary than at present from the millions of tons of rich ores that it produces annually. Considering the vote on the tonnage tax in the previous regular session, when the bill passed the House, and the purely tentative nature of Representative Burns's proposal, the plan this year commanded a surprisingly small amount of support. The vote of the House killing the resolution reflected its belief that the mines should remain under the ad valorem taxation system and such a lack of faith in the economic feasibility of the steps by which Mr. Burns proposed to encourage the development of an iron and steel industry in Michigan that it did not judge the plan worth the expense of an investigation. In the Minnesota Legislature the tonnage tax was defeated on a close vote, 55 to 61. The bill was similar to the one vetoed by the late Governor Johnson.

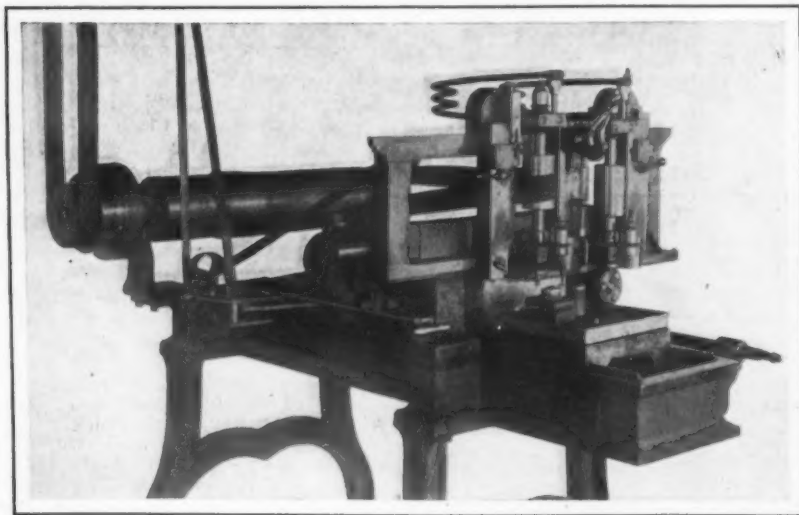


Fig. 1—A New Profiling Machine with an Automatic Feeding Device Invented by Charles R. North, Hartford, Conn.

The Laclede Gas Company, St. Louis, officially announces plans for the construction of coke ovens near St. Louis with a capacity of 250,000 tons of coke per year. The plant will cost \$5,000,000 and will be located on a 200-acre site owned by the company at the southern end of St. Louis. The coal will be brought by river from the West Virginia and Pennsylvania fields. The determination follows the recent increase in the price of gas oil, of which the company has been a great consumer. The new plant will be a by-product plant and the gas produced will be used in the public service distribution plant of the company, while the coke will be sold for furnace, foundry and other use. The first construction will be of 56 ovens in one battery. The equipment will be of the most modern and scientific type.

Belt-Driven Grinding and Polishing Machines

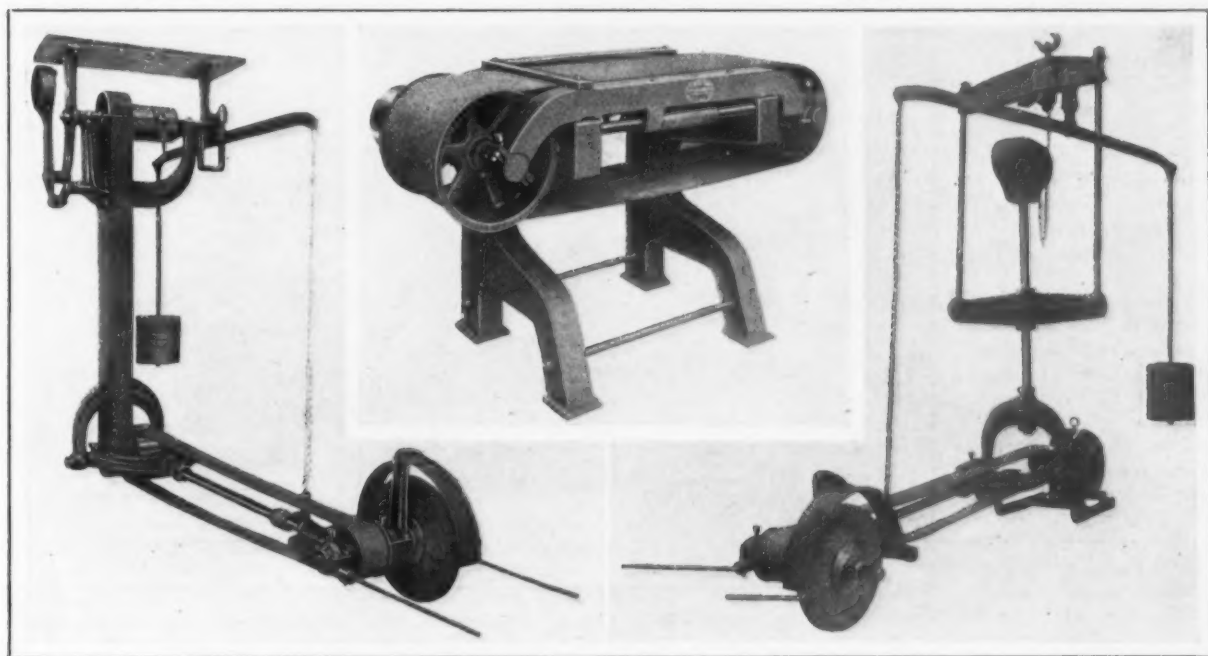
Improvements and additions to the line of grinding and polishing machines built by the Excelsior Tool & Machine Company, East St. Louis, Ill., include three types of swing frame grinding and polishing machines and a surface grinding and polishing machine. Two of the swing frame machines are designed for motor drive, while the other is belt driven and is furnished with a counterweight to completely balance it. This machine which is designed by the builder as its No. 8-A style is illustrated at the left of the accompanying engraving, while the type No. 8-B which is motor driven is shown at the right. The No. 28 surface grinding and polishing machine is illustrated in the central insert.

In designing the No. 8-A swing frame grinding and polishing machine care was taken to completely balance all the operating movements and it is pointed out that by the use of counterweights the only objection to this type of machine has been overcome. This machine is self-contained and the equipment includes the necessary belts, counterweights and a spindle wrench. There are three sizes of machine built for handling 12, 18 and 24 in. grinding wheels and the bearings in all sizes which are lined

ery cloth. The construction of the machine is rigid and all the moving parts are balanced to avoid vibration and the bearings are made dust and oil proof.

In the type No. 8-B swing frame machine, shown at the right of the accompanying engraving, it is intended that the motor shall partly balance the spindle end, while the backward and forward movement is balanced by the counterweight. In this design it is emphasized that easy movement is obtained as the arm rolls in the oblong end of the supporting rods, thus eliminating friction. This machine is intended for use in steel foundries and rail and frog shops where the service required is severe, and if desired can be attached to the hook of a traveling crane and raised or lowered as conditions may require. Like all of the grinding machines built by this company, it is self-contained and no special attachments or pulleys have to be fastened to the ceiling.

In addition to the two types of grinding machines shown, the company also builds a third one which is motor driven. This machine is intended for use where there is a large amount of dust and dirt. The motor is mounted in the upper portion of the frame and assists in balancing the machine. The grinding wheel is driven from the motor through a belt passing over a pulley at the lower



Type A Grinding Machine No. 28 Surface Grinding and Polishing Machine Type B Grinding Machine
Three New Belt-Driven Grinding and Polishing Machines Built by the Excelsior Tool & Machine Company, East St. Louis, Ill.

with babbit metal are of ample proportions and have oil or grease cups to provide lubrication. Turned and ground high carbon steel is used for the spindles and it is claimed that due to the method of completely balancing all the operative movements an area of 3 ft. square can be reached without undue exertion on the part of the operator.

Width of grinding surface, in.....	18
Length of grinding surface, in.....	36
Width of drums, in.....	18
Diameter of drums, in.....	15
Diameter of driving pulleys, in.....	10
Face width of driving pulley, in.....	4
Speed, r.p.m.	600
Weight, lb.	1,200

The foregoing table gives the principal dimensions and specifications of the No. 28 surface grinding and polishing machine shown in the small insert, which is designed for grinding and surfacing flat castings, such as parts of stoves, flat irons, valves and various kinds of tools, where it is necessary that the surfaces be accurately finished. In use the work is placed on the rotating belt the entire surface of which can be utilized and allowed to remain until the desired accuracy is obtained. The belt can be readily removed and replaced, and a tightening device is provided to give the required belt tension. The surface of these belts is set up in the same way as a polishing wheel with glue and emery and can be furnished in leather, canvas or em-

ery cloth. The construction of the machine is rigid and all the moving parts are balanced to avoid vibration and the bearings are made dust and oil proof.

All of the swing frame machines are built to handle grinding wheels having diameters of 12, 18 and 24 in. and the following table gives the principal dimensions and specifications which are the same for all three types:

Diameter of emery wheel, in.....	12	18	24
Wheel speed, r.p.m.....	1,600	1,050	800
Diameter of spindle, in.....	1 7/16	1 15/16	2 7/16
Width of belt, in.....	4	4 1/2	5
Power required, hp.....	3	5	7 1/2
Weight, lb.	1,000	1,600	1,900

The New York Air Brake Company's report for the year ended December 31, 1912, shows total income for the year of \$3,078,253, against \$1,644,395 in 1911, and net profits of \$572,380, against \$47,799 in the previous year. After the payment of dividends amounting to \$149,886 in 1912, a surplus was left of \$422,494, whereas in the previous year, after dividends of \$449,658 were paid, there was a deficit of \$401,859. President C. A. Starbuck states that the company has entered into an agreement with the Westinghouse Air Brake Company by which the former is licensed to manufacture under Westinghouse patents all parts of such equipment, thereby enabling both companies to manufacture and sell one standard equipment.

Combination Offset Boring Head and Drill Chuck

The line of combination drill and boring chucks made by the J. T. Flynn Mfg. Company, 1181 Porter street, Detroit, Mich., has been increased by the addition of a new

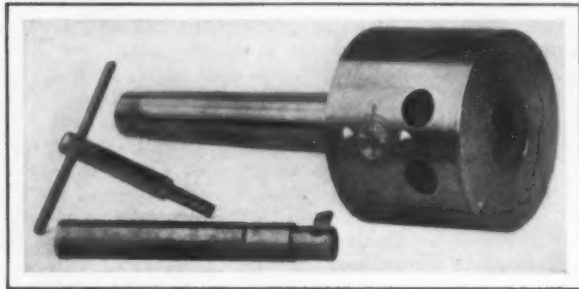


Fig. 1—A New Type of Combination Offset Boring Head and Drill Chuck Made by the J. T. Flynn Mfg. Company, Detroit, Mich.

combination offset type. The special features claimed for this chuck are a simple and compact construction, rigidity in use and ability to make adjustments rapidly. Universal jaws are used on all of the several sizes made and two screws are employed for making the necessary adjustments. Fig. 1 is an exterior view of the largest size, while Fig. 2 shows a chuck with a portion of the outer casing removed to illustrate the construction.

The chuck illustrated in Fig. 1 has universal jaws, equipped with two screws. One of these controls the rapid adjustment of the jaws and the other is what is known as the heavy duty or auxiliary screw. The jaws are guided by a flange on each side measuring $\frac{3}{4} \times 1$ in., as shown in Fig. 2. A tension nut at the back of the head forces the jaws against the inside face of the sleeve, and as they are V-shaped, a three point bearing $1\frac{1}{2}$ in. in length, is thus given on drills or boring bars. The head is threaded to receive a shank and can be fitted to either vertical or horizontal milling machines, drilling machines and turret or engine lathes. The

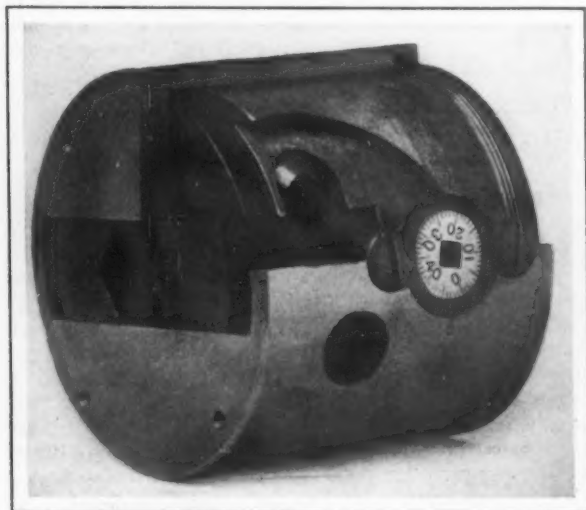


Fig. 2—A View of the Chuck with a Portion of the Outer Casing Removed to Show the Construction

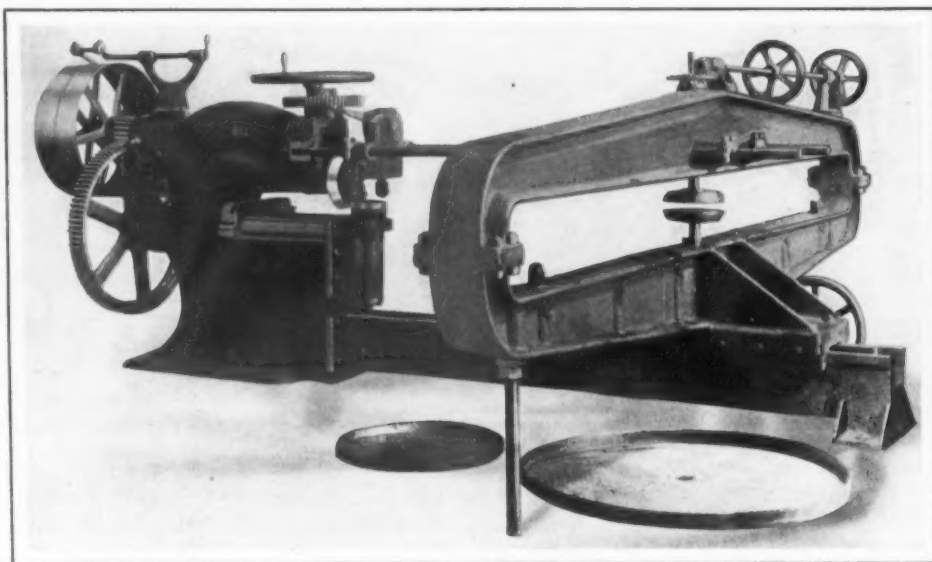
dial shown is graduated in thousandths of an inch to permit adjustment for counterboring, recessing and parallel boring and adapts the chuck for boring jigs and fixtures.

The body is 4 in. in diameter and 3 in. long, thus giving entire use of the cross travel of the milling machine. The chuck is pierced by a $\frac{3}{4}$ -in. hole and can be fitted to the spindle of a lathe, thus displacing collet chucks in working from long bars or for turning straight or eccentric pins. The chuck has a $\frac{3}{8}$ -in. offset and will accommodate drills or boring bars up to a maximum diameter of $\frac{3}{4}$ in.

Two other types of chucks are built. One of these has a solid cross block with V and is graduated on the face for different sizes of drills. The dial graduations are in thousandths of an inch, the same as in the chuck illustrated and conform with those on the face for locating the cross block in a central position for the different drill sizes. A smaller size of chuck accommodating $\frac{3}{8}$ -in. boring bars and having a boring range of 2 in. is also made.

Combination Flanging and Shearing Machine

For cutting circular metal disks from 14 to 110 in. in diameter from a square blank not exceeding $\frac{1}{4}$ in. in thickness and then flanging them to a maximum height of



A New Combination Machine for Cutting Disks from $\frac{1}{4}$ -In. Metal and Flanging Them Built by the Niagara Machine & Tool Works, Buffalo, N. Y.

$2\frac{1}{4}$ in., the Niagara Machine & Tool Works, 639 Northland avenue, Buffalo, N. Y., has brought out a combination flanging and rotary shearing machine. The metal is first cut into a circular shape of the desired diameter and is clamped between the two disks of the circle arm, after which the upper flanging roll is gradually brought down to form the flange. The capacity of the machine for flanging operations is disks ranging in diameter from 18 in. to 12 ft. Two specimens of the disks which can be cut and flanged by this machine are shown on the floor.

As will be noticed from the accompanying engraving, the machine has two horizontal shafts driven at the rear by connecting gears. The lower shaft is connected in front through a pair of mitre gears with a vertical shaft supporting the lower flanging roll, while the upper roll is mounted on the upper horizontal shaft which can be raised and lowered by a handwheel. A quick lateral adjustment for metal of different thicknesses is provided for the upper flanging roll. The clamping or circle arm is mounted on a base fastened firmly to the main frame and provision is made for adjusting the arm for different diameters of disks. The upper part of the clamping arm is fastened to the frame by two heavy shafts, also supporting a hold-down attachment which can be raised and lowered quickly by an eccentric lever. In this way, it is pointed out, great rigidity is secured.

If desired, the machine can also be used as a circle shearing machine by removing the flanging rolls and substituting a pair of cutters.

Interstate Commerce Commission Action

The Interstate Commerce Commission has acted in the following applications for relief with regard to iron and steel under the fourth section (long and short haul section) of the act to regulate commerce:

Rates on Scrap Iron and Steel.—Application of Nashville, Chattanooga & St. Louis and other railroads.—“This application (No. 7898) asks for authority to establish a rate of \$1.90 per net ton for the transportation of scrap iron and scrap steel, all kinds, except old rails for relaying purposes, minimum weight 40,000 lb., from Nashville, Tenn., to Alabama City, Ala., and group, and to Anniston, Ala., and group, without observing the long and short haul provision of the fourth section of the act. * * * The said application is hereby granted.”

Rates on Sheet Iron, Etc.—“This application (No. 7845) asks for authority to revise commodity rates on sheet iron and sheet steel, as described in the application, from Buffalo, N. Y., and on iron roofing, as described therein, from Buffalo, N. Y., Erie, Pittsburgh, Pa., Wheeling, Parkersburg, Huntington, W. Va., and Portsmouth, Ohio, to Chattanooga, Tenn., based on the sum of the intermediate rates to and from Cincinnati, Ohio, without observing the long and short haul provision of the fourth section of the act. * * * It is ordered, That pending the action of the commission upon any of the applications for relief from the provisions of the fourth section filed by the carriers or their agents on or before February 17, 1911, respecting rates on sheet iron and sheet steel and iron roofing from points of origin hereinbefore described to Chattanooga, the petitioners herein be and they are hereby authorized to establish rates on said commodities as described in the application * * * based upon the sum of the intermediate rates to and from Cincinnati, Ohio.”

In each case it is stated that the commission does not approve any rates that are filed under the authority granted, all such rates being subject to complaint, investigation and correction if in conflict with any other provision of the act.

Investigation of Rates on Iron Ore, Etc.—The commission has begun the preliminary work in an investigation which it decided upon some time ago, experts being detailed to collect information to be used as the basis of interrogatories by the commission when it begins taking testimony in connection with rates on iron ore, iron and steel and their products, and cement. The commission has assigned the preliminary work to Commissioner Clements, and he states that the investigation will begin in earnest some time this spring, probably the latter part of April. The investigation decided upon is a comprehensive one, and is sure to attract the closest attention in the iron and steel trade. Every railroad in Official Classification territory is named as defendant in the proceeding, and after the taking of testimony is begun it is believed that all the large iron and steel companies will be participants.

Not Limited to Local Insurance

President A. J. Lindemann of the Workmen's Compensation Mutual Liability Insurance Company of Milwaukee, Wis., calls attention to an erroneous statement regarding the scope of that company which appeared in *The Iron Age* of February 20. The assertion was made that the company is a local institution and will not seek membership outside of the city of Milwaukee. Mr. Lindemann says that for the present it will do business in the State of Wisconsin, but it is expected that the company will become very large and be an important institution in connection with the general development of workmen's compensation. The company is working in strict accord with the laws of Wisconsin, operating along scientific lines in keeping with the latest modern developments of this phase of the insurance business. Its office is in the Majestic Building, Milwaukee.

The National Wire Products Ltd., whose head office is at Montreal and principal works are at Port Arthur, Ont., will issue \$450,000 4 per cent. cumulative preferred stock.

New Sensitive Bench Drilling Machines

Two new types, or more properly speaking, two redesigned types, of sensitive bench and column drilling machines have been placed on the market by the Francis Reed Company, Worcester, Mass. The changes made include a box type of construction throughout, the increasing of the number of spindle speeds from three to six and the use of a special type of belt tightening device at the lower cone pulley on the column. Fig. 1 is a view of the bench type and Fig. 2 shows another type which is operated by foot treadle, although mounted on a bench.

Both styles of machines possess a large capacity for drilling holes up to a maximum diameter of $\frac{1}{2}$ in. The spindle in both machines has a bearing extending the whole length of the quill and is provided with a ball thrust. The end of the spindle is turned to fit all standard makes of chucks and is finished with a two-jaw chuck. In the No. 27 style, which is illustrated in Fig. 2, the lever is moved to its full traverse of 5 in. by the foot lever, thus leaving both hands free to hold the work. If desired,

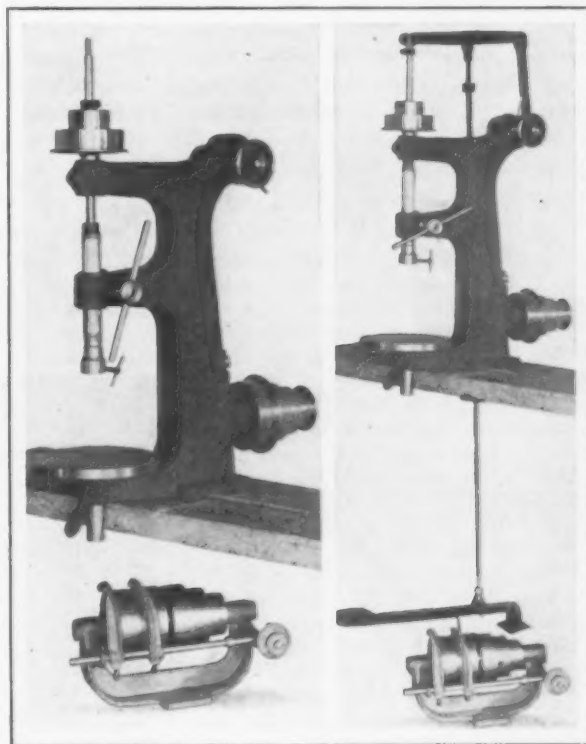


Fig. 1—The No. 26 Machine Fig. 2—The No. 27 Machine
Two Redesigned Sensitive Bench Drilling Machines Recently Placed on the Market by the Francis Reed Company, Worcester, Mass.

the hand lever can also be used on this machine. In both of these machines the cone pulley at the back slides to tighten the belt and has a push screw. The bearings in these new machines are bored out, no babbitt being used, as was the case in the older type, to line up some of the bearings.

These machines are made in two sizes, 14 and 20 in., and the following table gives the principal dimensions and specifications of both:

Maximum size of drills used, in.....	$\frac{1}{2}$
Minimum spindle speed, r.p.m.....	600
Maximum spindle speed, r.p.m.....	2,400
Minimum distance between chuck and table, in.....	9
Maximum distance between chuck and table, in.....	14
Diameter of table, in.....	11
Traverse of table, in.....	5
Traverse of spindle, in.....	5
Diameter of spindle, in.....	$\frac{3}{4}$
Diameter of smallest cone pulley step, in.....	3
Diameter of largest cone pulley step, in.....	5
Width of driving belt, in.....	$1\frac{1}{2}$
Diameter of tight and loose pulleys, in.....	5
Diameter of larger spindle driving pulley, in.....	$5\frac{1}{2}$
Diameter of smaller spindle driving pulley, in.....	$3\frac{1}{2}$
Speed of countershaft, r.p.m.....	900
Space required on bench, in.....	16 x 18

In addition to these two machines the company also builds two designs for mounting on a pedestal. In the case of the floor type with the foot treadle, the rod connecting the treadle runs up inside the pedestal and the column.

A Symposium on Sound Steel Ingots

The Papers and Discussion of the Wednesday Morning Session of February 19 of the American Institute of Mining Engineers

An important meeting of steel makers and steel users for whom the production of the sound steel ingot has direct vital interest was held in New York City on Wednesday morning, February 19. It was a session of the annual meeting of the American Institute of Mining Engineers given over to the Iron and Steel Division of the Institute. Several important papers on the sound ingot were presented, and there was a large gathering of engineers of railroads and other consuming interests and of steel makers and metallurgists. The result was the dissemination of an unusually large amount of valuable information, but at the same time there was an atmosphere of expectancy which was not entirely dispelled until the last few moments of the session, when it became apparent that most of the steel works representatives did not yet feel it expedient to take the engineering public into their confidences or to tell of their latest investigations. The practical sides of the problem were effectively displayed in the placarding in large letters on the front wall of the meeting room, in the Engineering Societies' Building, of four questions which many of the speakers undertook to answer. These questions were: 1. Is the present method of getting rid of the pipe by cropping, a safe and reliable device for making sound steel? 2. Is it desirable to increase the amount of metal arbitrarily cropped off the top of an ingot, and, if so, what would be a fair excess price to pay for cropping off 20 per cent? 3. Is it commercially practicable to make ingots without pipes or blow-holes, and what additional expense of manufacture would be justified to accomplish this result? 4. What process for making pipeless ingots seems the most promising of commercial success, and why?

Iron and steel metallurgy received conspicuous attention at the annual meeting last week of the American Institute of Mining Engineers. One whole day was given over to the Iron and Steel Division, which had made such a distinct mark for itself at the Cleveland meeting last October. Wednesday morning, February 19, was taken up altogether with the consideration of papers dealing with the sound steel ingot, while the afternoon of that day was occupied with a number of different subjects, including cast iron, the micro-structure of iron sinter, the valuation of iron mines and the design of the open-hearth furnace for producer gas. The voluminous character of the information bearing on the steel ingot is such that it has been necessary to hold over until the next issue the account of the Wednesday afternoon meeting, so that the subjoined review covers practically the morning iron and steel session alone.

This meeting of the Institute was its 104th, and was held on February 17, 18 and 19. It was an important one as regards its government, for at the business meeting, held on February 18, it adopted a set of bylaws. These, among other things, provide for a governing board of directors of a different classification and numerical strength than before and for the selection by the board of a secretary, instead of electing him by a membership vote. In last week's issue were enumerated the members of the new board, and this board on Wednesday afternoon elected Bradley Stoughton to the office of secretary of the Institute.

One of the important actions of the business meeting was the favorable vote on a union with the Institute of the Mining and Metallurgical Society, an action which, it is thought, provides in a measure for the special classification of "fellow," which had been proposed as the highest grade of membership. As will be recalled, in the discussion of this subject in the Cleveland meeting, reported in *The Iron Age* of November 7, 1912, the establishment of the proposed grade was not looked on with favor, but membership in the Mining and Metallurgical Society of

the American Institute of Mining Engineers will require that the applicant is already a member of the Institute. The coalescing of the two bodies must be ratified by a membership vote of the Society.

The meeting also voted against establishing a grade of junior member; against making the formation of local sections mandatory with the directors, but instead that it should be permissible; that members delinquent in dues should be allowed less time for payment than formerly, and that the assistant treasurer should hold no other office. The land committee, through Dr. James Douglas, reported that \$59,125 of the total remaining indebtedness of \$68,000 of the Institute's portion of the cost of the land occupied by the Engineering Societies Building had been subscribed and individuals stood ready to make up the deficit if other members did not contribute the difference. As mentioned last week, Charles F. Rand, president Spanish American Iron Company, is the president of the Institute and portraits of both Mr. Rand and Secretary Stoughton are here reproduced, and following the account of the Wednesday morning session will be found biographical sketches of the careers of these two officials.

There were four announced contributions relating to steel ingots, and these papers were all presented before the general discussion was taken up. The first of these was by Dr. P. H. Dudley, consulting engineer, rails, tires and structural steel, New York Central lines, covering not

only the piping and segregation of steel ingots but also ductility tests for rails. The second was by Dr. E. A. Beck, of the Goldschmidt Thermit Company, on the use of anti-piping thermit in casting steel ingots. The third was by Emil Gathmann, of the Gathmann Engineering Company, Baltimore, bringing out his commercially used ingot molds. The fourth was the paper by Benjamin Talbot, of Middlesbrough, England, presented before an informal meeting of the Iron and Steel Division of the Institute, November 7, 1912, but including some contributions to the discussion received after the



CHARLES F. RAND
President American Institute of Mining Engineers

meeting. With these papers may also be included one by Capt. Robert W. Hunt, comparing the results of the practice of rolling rails of the same specification with reheated blooms and by the direct process without reheating. Following may be found all these papers, and finally the general discussion from the floor, for, while Capt. Hunt's paper was not actually presented owing to the expected arrival of the author up to the time of the adjournment of

the session, it had been distributed. The discussion naturally took up largely the question of rail structure owing to the importance of ingot structure to rail condition, and also brought up the practice devised by Sir Robert Hadfield of England, and an interesting process, which has not yet been described in detail, developed with crucible steel in the works of the Simonds Mfg. Company and involving the compression of the ingot.

Mill Treatment and Ductility Tests of Rail Steel*

BY P. H. DUDLEY, NEW YORK CITY.

Bessemer steel of 0.10 to 0.15 per cent. of carbon, for splice-bars, spikes and tie-plates, rises in setting and is cast in bottle-mouthed molds, which must be capped to prevent an overflow from the top. This grade of steel rises in the molds and makes a longer ingot than the volume of molten steel when first teemed. The ingots which are allowed to cool and then cut open, show particularly in the upper part, large occluded blowholes, and when they are not oxidized or contain foreign matter weld more or less completely when the steel is rolled or forged about 1100 deg. C., and it is in this way that the blowholes are closed in the low-carbon steels.

Boiler-plate and firebox steel often contains more or less minute laminations, which are the remains of small blowholes forming after the setting metal has reached a pasty condition. The blowholes in the low-carbon steels have not been prevented by using deoxidizers, though the ingots are slightly improved so far as the soundness of the steel is concerned. This grade of steel also rises in the molds in setting.

Ingots of rail-steel containing 0.50 to 0.75 per cent. of carbon are of entirely different character when they are sufficiently deoxidized to form comparatively pure steel, as a well-defined shrinkage cavity forms. This important fact should be remembered in discussing rail-steel, for the greater the degree of its deoxidation, the larger will be the difference between the inclosed volume of hot fluid metal in the mold and the cooler resulting set metal, and the still proportionately less volume, should the ingot be allowed to become cold before equalizing the heat and rolling. We must deal with three conditions or stages of the steel:

1. The greater volume of hot molten metal.
2. The less volume of hot set metal.
3. The least volume of cold metal in the dimensions of the rail sections.

The exterior blowholes in the outside walls of the ingots can be prevented from forming by sufficient deoxidizers, as silicon, ferrotitanium, or their combination, and aluminum. The last has been extensively used, but all of its oxidation products do not always escape from the metal, and it should not be used when the steel is to be subjected to the present heavy steel wheel-loads.

The silicon content for rail-steel now ranges from 0.10 to 0.20 per cent., to make it sound and prevents small blowholes from forming in the setting metal.

When sufficient deoxidizers are used to purify efficiently the steel, then, as must be expected, a small cavity starts to form in the top under the cap of the ingot in the setting steel, as already described, and its development should be retarded by stripping the ingot and promptly charging into the reheating furnace.

Rail ingots are no longer allowed to become cold

before being charged into the reheating furnaces for blooming. The size and length of the ingots must be taken into consideration, for in those ingots of which the length is from four to five times the width of the base, the steel will set on the interior walls long before their vertical shrinkage of hot to cold metal has occurred, and this increased length will add proportionately to the volume of the interior piping or shrinkage cavity.

Ingot Size in Relation to Rail Sizes

It was customary a few years ago to teem ingots which were only 18 x 20 or 19 in. square, and roll four lengths of 100-lb. 33-ft. rails. The height compared to the base was so great that before any shrinkage occurred in the vertical hot ingot walls, the interior shrinkage cavities developed so large they could not be prevented entirely from forming, even by prompt charging of the ingots, after stripping, into the reheating furnaces to equalize the heat for rolling.

The 33-ft. 100-lb. rails rolled from four-rail-length ingots of the long type developed in the track a great many split heads and some true pipes, the product from two or three mills being quite pronounced in this respect. Of rails which were rolled during August and September, one purchaser removed in less than six years' service more than 10 per cent. for split heads. The trackmen would report these rails as piped, for the segregated metal in the head would crack under the fillet and admit the air, which would soon discolor the interior surface, and these were considered as piped rails. There was in some instances a true pipe or shrinkage cavity when rolled, which extended into the center of the web and well up into the head. The trackmen, however, were not able to distinguish between the true piped rails and the split heads, and it was some time before the latter were attributed to segregation and slag inclosures, which, when recognized, were nearly prevented in subsequent manufacture of rails.

When the mills began to make 33-ft. rails and teemed them in the same ingot molds which had been used for 30-ft. rails, and then rolled them in four 33-ft. lengths for 100-lb. rails, a great many ingots were not stripped, weighed and charged into the reheating furnaces with sufficient promptness to prevent a number of piped rails, as the requisite mill practice to check them was not then comprehended under the changed manufacturing conditions.

The segregation was also large, and in 1908, for the New York Central Lines, I confined the rolling of Bessemer and open-hearth rails in the United States mills to three 33-ft. rail-length ingots for those of about 19 in. square upon the base. It was also stated in the specifications for the New York Central Lines that short, stubby ingots of from 2.5 to 3 times the length of the width of the base were required for rails. Ingots of about 8200 lb. weight, teemed in molds 20 x 24 in., and, in good mill practice, with practically complete elimination of piped rails. The blooms, however, are cut, and only



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*Large portion of the paper presented under the title, "Piping and Segregation of Ingots of Steel and Ductility Tests of Rail Steel." Dr. Dudley is consulting engineer, rails, tires and structural steel, New York Central Lines.

rolled in three rail lengths at a time. Ingots 25 x 30 in., of about 12,000 lb. weight, have been used for eight 33-ft. basic open-hearth 100-lb. rails where the ordinary rail-mill equipment had not been installed. The ingots were bloomed and then shipped to a rail mill to be reheated and rolled, and but a few piped rails were found during manufacture. The rails in the track fulfill the requirements of safety and severe service.

The large mass of metal in the short ingots does not quickly cool, and from the teeming of from 60 to 80 ton melts the ingots would be charged into the reheating furnaces in 1 hr. 30 min., and before all the interior metal had set, with but a trace of a shrinkage cavity started. The distance run by the ingots on their cars from the open-hearth department to the strippers and then to the

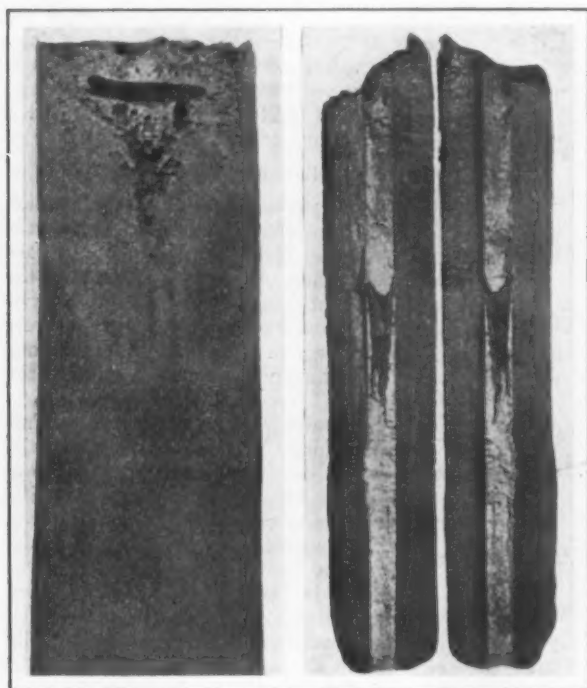


Fig. 1 Cavities in Ingot and in Crop from Bloom of Companion Ingot

reheating furnaces aids to consolidate the hot metal in the center of the moving ingots.

Cutting Cold Ingots to See Shrinkage-Cavity Volume

Ingots have been teemed and stripped in the ordinary manner, then taken to the reheating furnaces and when ready for rolling taken out, allowed to cool, and when cut, as would be expected, have shown a shrinkage cavity. The blooms from the companion ingots, when promptly charged into the reheating furnaces and rolled as in proper mill practice, would show only a small trace of the cavity compared to that in the cold cut ingot.

I do not know where similar comparisons will be found outside of my own work of cutting ingots which have been allowed to cool, and also cutting blooms of companion ingots as rolled under the best practice of to-day. The necessary mill-practice to secure pipeless rails must be understood, and the time-limit from teeming, stripping, weighing and charging into the reheating-furnaces, involves definite relations to the mass of metal, its chemical composition, the length of the ingots and size.

The specifications for the New York Central Lines require that as soon as the ingots are stripped, they should be charged into the reheating-furnaces to prevent the setting steel to cool from its molten temperature to that of cold metal and thus avoid the formation of the full shrinkage cavities in the ingots. It has been shown, by the cutting of a large number of blooms, that the shrinkage cavity in the top of the hot ingot is not more than 1/20 to 1/30 of the size of that formed by permitting the ingot to become completely cold before it is put into the reheating-furnace for rolling.

There are only 25 piped rails known to have been found subsequently in service in the track in 65, 70, 75, 80, 95, and 100 lb. sections out of about 1,100,000 30-ft. rails, of which the length of the ingot was not over but under

three times the width of the base. The ingots were all stripped by hand in the teeming-pit and charged into horizontal reheating-furnaces, a mill-practice long since abandoned. Many 0.06 per cent. phosphorus and 0.60 to 0.65 per cent. carbon rails are still in freight- and branch-line service. Some split heads have developed in these rails, due to segregation and the heavy service to which they have been subjected.

Designating Rails by Position of Metal in Ingot

I was at the mills co-operating in the manufacture and inspection of rails and commenced in 1893 to indicate their position in the ingots and stamped on the web of the top, middle and lower rails the letters *A*, *B*, *C*, respectively. This was for the purpose of studying their subsequent wear and behavior in the track. The practice has been so instructive that designating the rails by letter for identification in the track has become general for the United States.

The *A* rails contain a larger percentage of oxides, which rose in the steel before completely setting in the ingots, and wore faster than the *B* or *C* rails under the same traffic. The breakages, however, have been slight in the *A*, *B* or *C* rails after their many years of service.

The ingots were teemed with sharp corners in the molds, of about 2.5 in. radius, and in the *A* rails particularly, oxides and slag were entrained in the corners by the columnar structure of the setting steel. The gauge-side corner of the *A* rails would show indications of breaking down and spawling to a greater extent under the heavy traffic than the *B* or *C* rails. It was possible, after the rails were in the track 8 or 10 years, to identify by casual inspection the *A* rails from the *B* or *C* rails, by the more frequent spawling on the gauge-side corner of the head.

Use of Deoxidizers to Secure Sound Steel

The views of Benjamin Talbot and Sir Robert Hadfield are old, as to the desirability of completely eliminating blowholes and causing the steel to set sound at the risk of producing a shrinkage-cavity, which must be checked from full development, and have been held and practiced by me for the past 30 years in the production of ingots for steel rails. The deoxidizers, aside from the manganese, should be sufficient to cause the steel to set sound, as is shown in the metal of the cut ingot, Fig. 1, without blowholes nearly to the extreme top of the cold ingot.

The suggestions of Mr. Talbot and Sir Robert Hadfield, to use a large percentage of aluminum in the ingots to reduce more completely the oxides, I do not consider advisable, from the difficulties already experienced with aluminum so used in rail-steel for our heavy wheel-loads. It would be better to use silicon or a combination of silicon and ferrotitanium to secure the desired results. We do not use as high percentages of silicon in steel as is employed abroad, except for tires.

It is now found for our heavy wheel-loads and severe service in the low temperatures of several of the important trunk lines that the high-silicon tires break more frequently than those in which the content is lower. The suggestion to use from 0.3 to 0.4 per cent. of silicon in rail-steel without modification of the other chemical constituents would involve the risk of many rails breaking from the slipping of the drivers upon the rail heads. We must proceed with proper caution in introducing deoxidizers which remain (or their oxidation products are liable so to do) in the bath of steel. Ferrotitanium, while more expensive than either aluminum or silicon, also acts as a flux, and can be used without danger of leaving its oxidation products in the well-made bath of steel.

Segregation of Basic Open-Hearth Steel-Ingots

The segregation of Bessemer ingots has been studied extensively, but the basic open-hearth ingots for steel-rails and wheels have not received requisite attention. I have studied their segregation in several ingots, but do not find it as great in well-purified steel as might be expected from Bessemer, which contains two or more times the impurities of phosphorus and sulphur. Well-melted, purified basic open-hearth steel sets quietly and the segregation becomes less in degree.

The Illinois Steel Company, at Gary, when rolling rails for the New York Central Lines in 1912, at my request

charged an ingot weighing 8100 lb. into the reheating furnace as in ordinary mill-practice. In about 2.5 hr., when in condition to roll, it was set outside the furnace to cool. The ingot was 20 x 24 in. on the base and poured 73 in. long.

The shrinkage cavity shown in the cold cut ingot, Fig. 1, is fully developed from hot to cold steel, and is more than 20 times larger than in the bloom crop of the rolled companion ingot as charged in the usual mill practice. Charging the ingot 10 or 15 min. earlier would have prevented even as large a shrinkage-cavity as found, in the bloom crop, though it shows that 1.4 per cent. of sound metal was cut off in the usual discard and 0.75 in. in depth was planed from the center of the bloom and the small cavity was entirely removed. The crop from the 8 x 8 in. bloom, 46 in. long, from the companion ingot was split to examine the shrinkage-cavities and segregation; see Fig. 2.

Drop and Exhausted-Ductility Tests for Open-Hearth Rails

The exhausted-ductility tests for the purification of the steel were introduced into the specifications for the New York Central Lines in 1910 to secure from the preceding 18 years' experience with the elongation tests Bessemer rails of sufficient toughness to withstand the low temperatures in the Mohawk valley of 20 to 30 deg. below zero, though 40 deg. is often reported by the trackmen.

The ductility which is possible for a given composition, size of ingots, section and other points of manufacture, has been practically ascertained, and it is to see by the exhausted-ductility tests whether or not it is secured.

It requires but a moment to stamp the crop of the rail with the 6-in. spacing bar of seven points before placing the butt on the supports of the drop-testing machine. The elongation of each of the six marked inches on the test butts after the drop is measured by a flexible rule, and the increase in hundredths of an inch per inch indicates the per cent. of elongation. It takes but a moment to test the butt, and the exhausted ductility is obtained in three or more blows, though it is measured after each blow and recorded. The lower carbon content of the specification gives one range and the maximum content a higher range, and the mean carbon content is between the two. One of the three can be used as may be necessary in locations for safety, speed and wheel-loads of service.

The term ductility in the specifications for the New York Central Lines is used in the sense of tenacity and toughness of the steel, the exhausted ductility being its measure. This also becomes a soundness test for seams, segregation, slag inclusions and other foreign matter in

the web or head of the rails, and is better than the special nick-test in other specifications.

The elongation and exhausted-ductility tests are made concurrently with manufacture at the plant under the drop-testing machine on 4 or 5 ft. lengths of the top crop of the rail bars. The butts are tested within 3 hr. or less after the ingots of a melt are teemed and rolled, and the facts as to the full ductility of the steel as made and rolled are available for the manufacture of subsequent melts. The heavy body of slag over the top of the molten steel in the ladle did not allow sufficient heat to escape to modify the ductility in well-made steel from the first to the last ingot poured.

Conclusions of Present Basic Open-Hearth Rail Manufacture

1. The chemical composition should provide for sound steel of ample physical properties of tenacity and toughness rather than hardness combined with brittleness.

2. The impurities, phosphorus and sulphur, should be of minor content so the bath of metal can be purified to produce the large percentage of toughness and ductility due to the specified chemical composition.

3. The ingot should have such relations of area of base compared to the height and weight that under good mill practice and suitable deoxidizers it can be made with controlled segregation and only a trace of a shrinkage cavity in the top; then, when bloomed under its equalized initial heat, it is rendered pipeless by the usual 8 to 10 per cent. discard.

4. Aluminum can be replaced and silicon partly, as deoxidizers, with advantage by the use of ferrotitanium to purify, solidify and check segregation in rail, tire and axle steels, and also some of the lower grades of carbon steels where great purity is desired.

5. The ductility and elongation tests to date furnish the best and only prompt means of determining the degree of purification of the steel per melt as it is made by indicating the physical properties secured before another melt is tapped from the same furnace, and is of decided advantage to the manufacturer as well as to the consumer. These tests are so advanced that they must be applied with knowledge and understanding for proper results, and not made mechanically for specified records.

6. Every process or step of the entire manufacture of the steel and rolling and finishing of the rails must contribute its part to secure the highest quality of the product incident to the chemical composition.

7. Specifications should be drawn to indicate some of the major necessities of the consumer, and the tests and inspection conducted in a spirit to aid and invite the co-operation of the manufacturers to meet the progressive requirements in rail steel.

Proportions of the Mold to Make Sound Ingots

BY EMIL GATHMANN,* BALTIMORE, MD.

In presenting this paper I will attempt to answer certain questions proposed at this meeting and describe and illustrate methods of producing sound steel in an economical and hence commercial manner, which are adaptable to the production of practically all steel manufacturers, by readily effected rational changes in the methods of casting, cooling and subsequent handling of the ingots.

In some of the high-grade mills of America, where it is essential to obtain perfectly sound billets or blooms, it is the practice to discard from 35 to 40 per cent. of the crop- or pipe-end, and even with this excessive discard, secondary pipe or shrinkage-cavities are frequently discovered during subsequent working of the blooms and billets into their various manufactured products. The usual discard of from 10 to 20 per cent. from the crop-end of the ingot, which is made by the present generally employed methods of form and solidifying of the castings, certainly does not give the slightest assurance of the salable product being physically sound or chemically homogeneous. I am aware that in the past there has been and at the present time there still is a decided dif-

ference of expert opinion as to what constitutes physically sound steel.

Physically sound steel, as I would classify it, must be free from blowholes as well as pipe. The line of demarcation between harmless and harmful blowholes is exceedingly difficult to define. It is certainly the better and safer practice to eliminate blowholes from the salable portion of the ingots and to form a well-defined shrinkage-cavity or pipe at the upper crop-end of ingot. The higher grades of steel are all piping-steels. Is not their superior physical quality due to this fact as well as to their better chemical composition? Such is the case, in my opinion. Steel has frequently been chemically excellent in the furnace or ladle but of very poor or indifferent quality in the ingot and in the subsequent manufactured shapes.

Investigation with Different Shape Ingot Molds

It has been my experience that the freezing or solidifying of an ingot which has been practically deoxidized or, as the term is used, "killed" in the mold, depends entirely upon the shape of the horizontal cross-section of the ingot at its various planes from top to bottom, and also upon the thickness and consequent heat-absorptive power of various parts of the mold walls. This will

*The author of this paper, printed nearly in full, is consulting engineer of the Gathmann Engineering Company, and his process is used in some of the plants of the Crucible Steel Company of America.

be best understood by referring to an experimental group of four ingots, each of same actual volume and weight, cast of crucible-steel from same heat and ladle. Ingot No. 1 was cast in a mold having uniform thickness of walls from top to bottom; the section at the lower portion was widest and thus the slowest to cool. The oxidized pipe extended approximately 60 per cent. of the vertical length and mass of the ingot and could be traced within 10 per cent. of the bottom. This ingot was shaped similar to those used in ordinary open-hearth practice with big end down, but had the same cross-sectional area of metal at the upper as at the lower portion, this area being rectangular at the upper portion and approximately square at the lower portion. The factors are respectively 4×4 at the lower and $3 \times 5\frac{1}{2}$ at the upper portion.

No. 2 showed an ingot of similar cross-sectional area at the top as at the bottom, viz., it being 4 in. square at both top and bottom. The oxidized pipe in this instance extended 33 per cent. of the vertical depth and volume. The

and teemed ingot (approximately from 80 to 85 per cent.) and retard the cooling of the uppermost portion of the ingot, thus causing the upper portion to remain liquid longer and to act as a feeder. The upper portion of the ingot does not actually remain liquid much longer than in the usual practice for similar cross-sectional area, but as the cooling of the lower portion is greatly hastened a differential in cooling is obtained, which is really what is to be desired. Similar results have been obtained by employing firebrick, or heating of the upper part of the ingot by coke, charcoal or the like; but these methods usually offset any saving in a reduction of the crop-ends, by their cost and delay in application.

In ordinary big-end-up practice, where sufficient taper or differential in distance from the vertical axis to the surface of the ingot is given, to accomplish any notable reduction in depth of piping, the actual cross-sectional area of lower part of the ingot is much less than that at the upper part, hence the depth of pipe is not the true

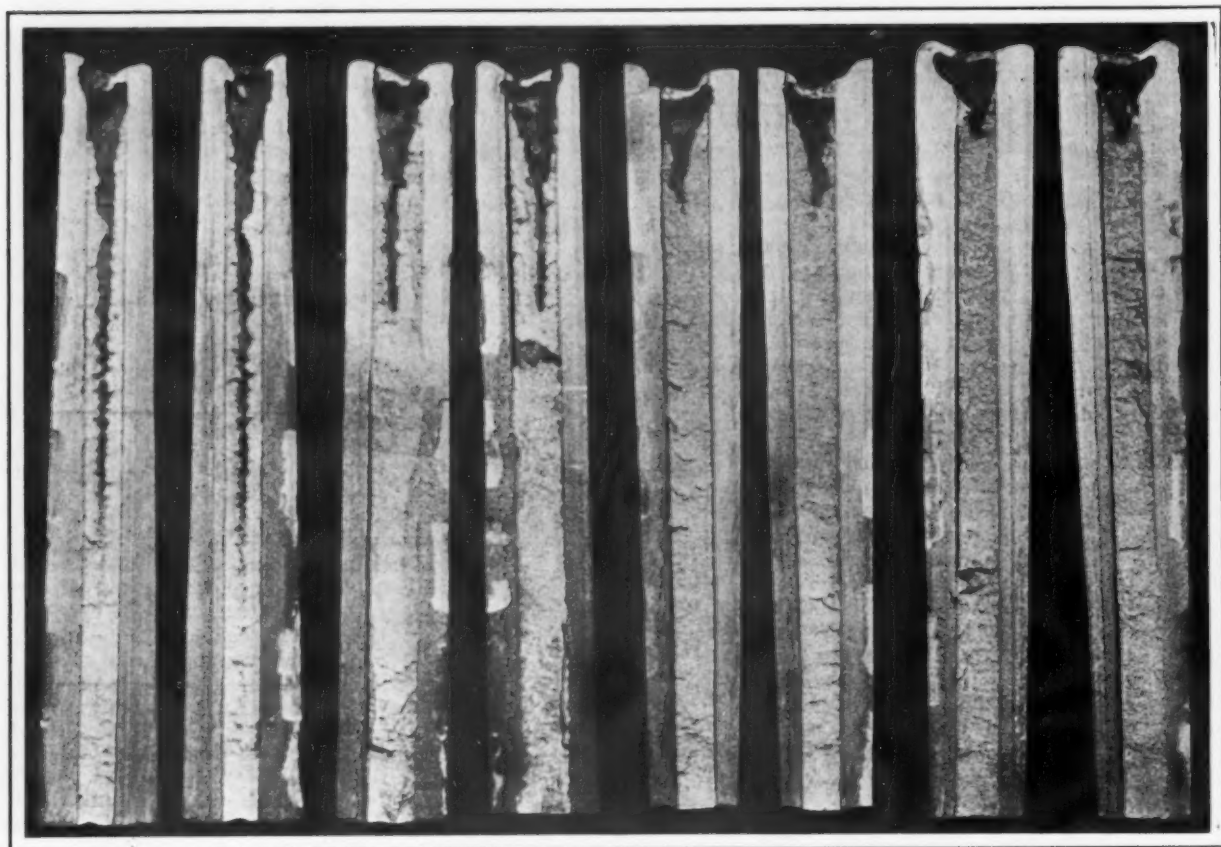


Fig. 1—Piping in Ingots Cast in Different Shape Molds

ingot below the oxidized pipe was sound. This ingot was cast in a mold similar to that used in ordinary crucible-steel practice, which has a uniform thickness of walls from top to bottom.

No. 3 was an ingot cast with big end up, the upper sectional area being 4 in. square and the lower sectional area 3 in. square. The thickness of the mold wall was uniform from top to bottom. The oxidized pipe was approximately 20 per cent., the steel below the pipe being perfectly sound. This type of mold conforms to the ordinary "big-end-up" practice, which has been used to only a limited extent in America, but considerably abroad.

No. 4 was an ingot cast in accordance with my method, wherein the mold walls were heavy and accordingly chilled the ingot rapidly for about 85 per cent. of its vertical height and mass, the upper portion of the walls being made thin and less heat absorptive. The oxidized pipe in this ingot is about 10 per cent. of the vertical height and mass.

These ingots were all made in split molds, necessary by reason of their cross-sectional shape. For open-hearth or solid molds this practice would necessarily have to be somewhat modified. Specifically, the new method employs a metallic mold constructed to accelerate the cooling of the lower or greater portion of the molten mass

index of the actual volume or weight of cropping necessary to obtain physically sound steel.

One of the advantages of my system or type of ingot is that it is possible to obtain a practically uniform cross-sectional area at top and bottom of ingot and still obtain the benefits of the big-end-up type of mold. Lifting of segregation is generally conceded to follow the reduction of pipe, and where the pipe is lifted the steel below undoubtedly becomes more homogeneous and freer from segregation.

For open-hearth practice with the big-end-up ingot, one of the greatest difficulties has been to devise a method of stripping and handling the ingots. I have worked out a method which will accomplish this result and not interfere with the prevailing administrative practice or reduce the tonnage production; in fact, if anything, these new methods of stripping should increase the tonnage as well as insure the sound steel with a greatly reduced cropping.

Stripping the Ingot

Fig. 2 shows the Gathmann ingot mold and stool on a car or buggy after teeming. The big-end-up mold will require a special type of stool to avoid such difficulties as might ordinarily be experienced in stripping, due to fins forming at the base of ingot and locking it to the mold.

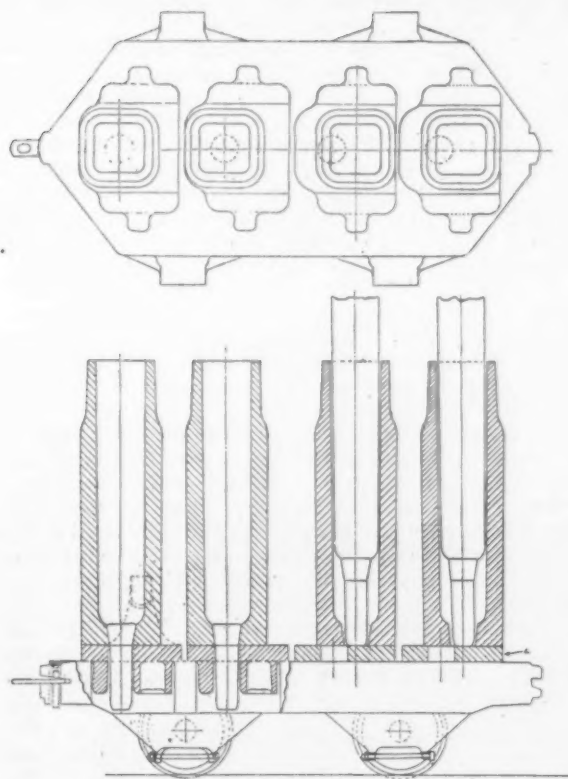


Fig. 2—Gathmann Ingot Mold and Stool on Car

A downwardly tapered plug seals the base of the mold and projects through the stool. When the teeming is finished the metal, by reason of the wedge-like taper at the

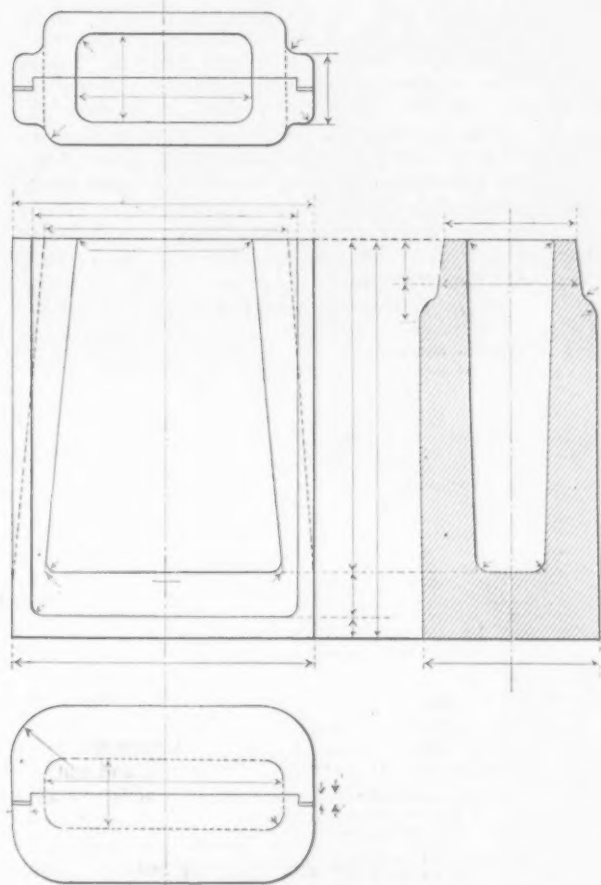


Fig. 4—Design of Slab Ingot Mold

lower portion of the ingot, is forced into virtual contact with the walls of the mold, which, due to their thickness, rapidly absorb the heat of the ingot. A slight differential

or reverse taper of the ingot cavity is made 15 to 20 per cent. from the top of the mold. The ingot in shrinking will automatically provide an air space at this portion, thus breaking the contact of ingot from mold walls and retarding the flow or loss of heat from this portion of ingot.

Fig. 3 shows a stripper of well-known construction with some details changed to suit the stripping of the big-end-up mold. The usual plunger is provided with a yoke whereby the lifting-lugs on the mold may be engaged. The plunger may then be raised or lowered, thus raising or lowering the mold, and in case of the ingot sticking in the mold upon lowering, the yoke is forced downward on the mold which rests on the combined sealing- and stripping-plug; the ingot is thus projected above the upper part of the mold, or rather the mold is lowered down, exposing the upper part of the ingot. If a "sticker" is encountered the weight of the thrust from the

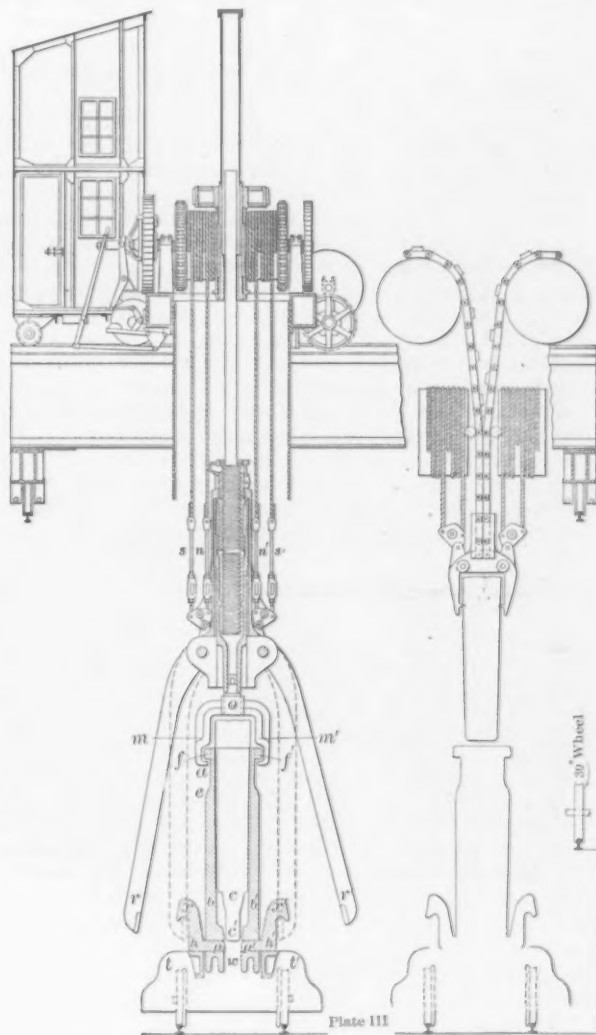


Fig. 3—Stripper Arranged for Big-End-Up Molds

yoke on the upper portion of mold is taken up by the hanging arms, which engage the lugs on the stool. The usual soaking-pit crane is employed to remove the ingot entirely after it is exposed above the mold walls.

Fig. 4 shows a slab ingot mold designed for plate- or sheet-mills desiring to roll directly from the ingots. This ingot is made similar to the crucible-steel ingots, with uniform cross-area at top and bottom so as to obtain equal width from finished plates or sheets. The ingot may be designed of approximately the following general dimensions: 10 x 20 in. at the upper portion and 7 x 26 in. at the lower portion. The nearest distance from the vertical central axis of ingot to the surface of the same would thus be 5 in. at the top of the ingot, and but 3.5 in. at the lower part, with approximate progressive dimensions intermediate. This ingot is cast in a similar design of mold as previously described, wherein the cooling is greatly accelerated by means of absorptive action of heavy mold walls. This mold is necessarily made in two

parts and held together with clamps in order to allow ready stripping of the ingot.

Résumé

The general practice as outlined reduces the pipe in the deoxidized or killed steel so that with an average discard of 12 per cent. sound metal will be obtained. Segregation will undoubtedly be disposed of in direct ratio to the lifting of the pipe. The stripping apparatus and bottom-sealing stool makes practicable the use of the big-end-up ingot without complications in removing the ingot. The system is not in an experimental stage, as many tons

of steel are daily being cast in both open-hearth and crucible plants in accordance with it.

The features which require special mention are:

1. No increase in cost of manufacture.
2. Simplicity in (a) construction and (b) operation.
3. No radical interference with present plant practice.
4. No skilled labor or supervision and attention required beyond such as may at present prevail in any mill.
5. It reduces the piping and provides physically sound steel by the accompanying lifting of segregation. The methods, apparatus and ingot described in this paper are covered by United States and foreign letters patent.

Same Specification Rails Made in Different Mills

BY ROBERT W. HUNT, CHICAGO

I have frequently stated that while the chemical composition of steel was important, yet even greater importance was connected with the mechanical and heat treatment of the metal. During the past year I encountered such a positive example of that fact that I deem it worth putting it on record.

A prominent railroad system divided an order for open-hearth steel rails between two steel works, both of which are under the control of the same corporation, giving to one about 18,000 tons and to the other 7500 tons of the same section and to be made under the same specifications. The rolling results obtained in two mills varied so widely that a study of the figures is intensely interesting and serves to illustrate the advantages obtained by careful ingot casting, and quite as pertinently the possible benefits of careful subsequent heating and rolling with moderate reductions in the rolling process. The smaller order was rolled complete in four installments during the same months that the larger order was being made in eight separate installments; but, to permit of exact comparisons, the totals of the four installments, completing the order with the mill which I will call A, are given with the totals of the first four installments of the larger order, made by the mill designated as B. These rolling results are tabulated:

Rails Produced from Same Composition Steel at Two Different Mills

	Mill A	Mill B
Number of rollings.....	4	4
Total number of rails rolled.....	18,278	27,832
Percentage of rails cut to short length because of flaws near ends, etc.....	0.7	7.6
Percentage of rails made second quality for flaws, etc.....	0.9	6.3
Percentage of rails scrapped for flaws, etc.....	0.6	4.5
Percentage of rails scrapped for failure at drop test	None	3.4

It should be stated that the figures shown cover all the reasons for putting the rails in the classes stated. Thus a part of the percentage of rails cut to short-lengths may have been because of bad drilling or bad sawing. Such classification, however, in this case is entirely proper, as neither mill suffered from unusual or abnormal difficulties in any way, and the figures indicate ordinary performance uninfluenced by unusual errors of either workmanship or mechanical troubles in rolling.

The chemical composition and drop-test specified with the average results obtained, were as also here given:

Specified Composition and Tests of the Rails

	Specified	Average obtained	
		Mill A	Mill B
Carbon, per cent.....	0.55 to 0.70	0.60	0.61
Phosphorus, per cent., not over....	0.045	0.023	0.023
Manganese, per cent.....	0.65 to 0.95	0.83	0.74
Silicon, per cent.....	0.075 to 0.18	0.13	0.14
Sulphur, per cent., not over.....	0.055	0.029	0.039

	Min.	Max.	Min.	Max.	Min.	Max.
Deflection on 4-ft. supports with 2000-lb. top falling 20 ft., in....	1.75	3.25	2.3	3.2	2.2	3.8
Average deflection, in.....			2.7		2.8	
Number test pieces breaking on first blow.....			0		9	
Number test pieces showing pipe or segregation when nicked and broken.....			3		9	
Number heats rejected because of two pieces failing at drop test.....			0		2	
Number heats rejected for exceeding deflection limits at drop test.....			0		4	
Number heats rolled.....			119		173	

Emphasis should be laid on the fact that both mills

were working to exactly the same specification, and producing a section which has been in use for several years and in large tonnage. It is an 85-lb. one, having 36.7 per cent. of metal in the head, 22.2 per cent. in the web and 41.1 per cent. in the base, being, therefore, well proportioned for the avoiding of torn flanges or other rolling difficulties, sometimes encountered with sections having thin flanges.

Both mills took advantage of the full range permitted in the chemical limits, and how successful they were in obtaining consistent carbon results is shown by an accompanying table:

Consistent Carbon Results Obtained at the Two Mills		
Carbon permitted per cent.	No. heats Mill A	No. heats Mill B
0.55	..	20
0.56	1	8
0.57	2	9
0.58	4	14
0.59	5	12
0.60	17	16
0.61	17	14
0.62	14	14
0.63	13	14
0.64	14	15
0.65	11	7
0.66	8	7
0.67	9	10
0.68	4	6
0.69	..	6
0.70	..	1
Total number of heats	119	173

It will be noted that mill A's results were more consistent than B's. The chemical composition obtained at the two mills agree so closely that some other reason must be sought to explain the divergent physical results obtained in the product, and, therefore, data on the actual performance of the mill operations is important. The principal items are also tabulated:

Differences in Mill Operations at the Two Plants

	Mill A	Mill B
No. of furnaces making steel.....	6	27
Avg. size heats cast, lb.....	196,000	183,500
Max. wgt. heats cast, lb.....	214,000	220,000
Min. wgt. heats cast, lb.....	128,000	155,000
Avg. time metal held in ladle before casting, min.....	4	3 1/2
Max. time, min.....	11	52
Min. time, min.....	1	2
Avg. No. ingots per heat.....	20	23
Max. No. ingots per heat.....	22	28
Min. No. ingots per heat.....	13	20
Avg. time between casting and stripping, min.....	43	67
Max. time, min.....	135	355
Min. time, min.....	24	15
Avg. time between stripping and charging in soaking pits, min.....	16	46
Max. time, min.....	66	660
Min. time, min.....	3	10
Avg. time bet. charging in soaking pits and blooming, min.....	140	167
Max. time, min.....	†270	*305
Min. time, min.....	90	60
No. cold heat charges.....	8	0
Per cent. top discard.....	10 to 13	10 to 12
Time in reheating furnaces, min.....	20 to 50	20
Average weight ingots, lb.....	9740	7970
Size of ingots, in.....	22 x 26	20 x 24
No. passes in blooming mill.....	21 to 25	9
Size of bloom produced, in.....	7 x 9	8 x 8
No. passes in rail mill.....	11	9
Total passes.....	32 to 36	18

*Indicates one heat in pits 24 hrs.

†Indicates one heat in pits 25 hrs.

‡Mill B rolls direct, does not reheat.

It will be especially noticed that both mills were casting large heats, approximating 85 tons. These were made by almost identical methods of the usual scrap and pig iron process, the iron taken from mixers, as required, and varying in proportion to the scrap used. As far as pos-

sible, at both mills, this mixer metal was used for re-carbonizing in the furnace, but many heats had coke or coal added to the ladle on tapping, in addition to the usual ferromanganese and ferrosilicon. While the heats at mill A were slightly larger than at B, the difference is not of importance, but it is pertinent to note that there are but 6 furnaces represented at mill A as against 27 which furnished the rail steel at B; and consequently, there were probably but two steel melters working at A as against at least six at B. The personal equation may, therefore, have played an important part in making the steel.

Delays in Stripping Ingots and Charging Soaking Pits

Equally noticeable is the fact that, while the average for the time intervals of the various operations at the two mills is not much different, still the range between the maximum and minimum for B are consistently greater than for A. There can be but little doubt that a delay between casting and stripping ingots and between stripping and charging in the soaking pits is likely to be seriously reflected in the soundness of the ingots, and of at least equal importance, is the necessity for teeming the steel at uniform temperature. A variation of 50 min. in the time heats were held in the ladle prior to casting must have caused variable teeming temperatures, and produced many blow holes in some of the ingots. Admitting the presence of blow holes, near the surface of the sides of the ingots, and remembering the oxidizing action in the soaking pits, it is not surprising that heavy reductions in the blooming mill had an extremely detrimental effect on the product. This is reflected, no doubt, in the large number of rails found containing flaws at mill B, as enumerated in the table at the bottom of the first column on the preceding page.

Reheating Blooms in One Mill

Appreciating, therefore, the probable difference in the ingots produced at the two mills and the actual difference in the blooming practice, the principal other variable existing was in the reheating of the blooms at mill A. There the ingots were cut into four blooms, which were then given a wash heat in reheating furnaces after which they were rolled into two rails in a rail train of 11 passes. At mill B the rail train consisted of 9 passes with no reheating of the blooms.

It is interesting to note the reported history of the heats rejected at mill B. Two heats were rejected at the drop test because two of the three test pieces broke on the first blow of the tup. The steel of the first heat was reported as being somewhat low in temperature when tapped. While pouring, the nozzle froze up and while the ingots were in the soaking pits an average of 4 hr. 20 min. they bloomed cold and rough. The second heat was quite the opposite, the tapping temperature being high and while casting the stopper head was finally lost, but the heating and the blooming were normal.

Four heats were lost at the drop test, because they exceeded the deflection limits. On the first, all conditions were reported normal, save that the ingots were held in the pits for an average time of 24 hr. The second heat tapped cold, the pouring nozzle froze, and the ingot tops were spongy. The third tapped hot but otherwise, and like the fourth, had normal conditions. Analysis of rejected heats gave:

C	P	Mn	Si	S	Remarks
0.70	0.015	0.74	0.11	0.034	2 pieces broke.
0.57	0.020	0.65	0.08	0.035	2 pieces broke.
0.55	0.014	0.65	0.08	0.036	Deflection over limit.
0.55	0.017	0.65	0.09	0.037	Deflection over limit.
0.60	0.026	0.71	0.11	0.041	Deflection over limit.
0.57	0.026	0.75	0.08	0.051	Deflection over limit.

The Use of Thermit in Casting Steel Ingots

BY E. A. BECK,* NEW YORK CITY.

Formerly the process of using thermit to do away with piping was to introduce a can filled with thermit, attached to an iron rod, into the head of the ingot directly after it had been poured. This result can be attained by the application of a large enough quantity of thermit, but it would not be economical in general practice and could only be used for high-grade material.

The Th. Goldschmidt Aktien Gesellschaft, Germany, has made a special study of this question with the co-operation of a well-known steel company and has worked out a new method for the application of thermit for this purpose. The results obtained have been most satisfactory and reliable, and this process is now used in Germany on a large scale in many prominent steel works.

The thermit is applied in cans, as in former years, but the principle of the process is entirely different. The object of using the thermit is not to heat the steel and keep it liquid, but to create a stirring reaction in the ingot, by which means large segregations, blow-holes and pipes will be materially reduced, if not practically eliminated. In order to obtain the most beneficial results the can must be introduced as far as possible into the ingot, so that the reaction is practically started at the bottom of the ingot and the stirring action proceeds from the bottom to the top. In a general way this is the operation of the new method through which, by the application of a very small amount of thermit, beneficial effects are obtained.

Application of the Thermit

The best results were obtained in so-called non-silicon treated material, used especially in the manufacture of sheets and plates. One of the most important factors is to introduce the anti-piping can at the right time. This time can be easily determined by noting the thickness of the crust which is formed on the surface of the ingot in cooling. Dr. Canaris writes as follows: "After the reaction ceases, the surface of the still liquid material sinks, according to its condition, from 70 to 150 mm. (3 to 6 in.), while the solidified walls remain intact. Then enough hot metal is quickly added, by direct pouring from the

ladle, to bring the surface of the still liquid interior of the ingot to the same level as the solidified walls. The moulds are then immensely covered and the ingots left to cool."

If the ingots are poured from the top there is more hot material on the surface and therefore the crust forms more slowly, whereas the interior of the ingots cools more quickly. For this reason the can must be introduced earlier than in the case of bottom pouring, as the steel nearer the bottom is cooler. In top pouring, the right moment for the introduction of the can is when the crust formed has extended over about one-half the surface of the ingot. In an ingot of 5 tons it takes, under normal circumstances, about 7 min. for the cooling to proceed to the proper point for the introduction of the can.

Should it not be possible to add more metal, the hollow space formed by the sinking of the metal should be filled up immediately with fine, dry sand and covered in the usual way. If the ingots are covered and neither the additional pouring made nor the hollow space is filled with sand, the steel will rise again to the cover. In this case, although segregation and large blow-holes may be eliminated to a certain extent, the desired greater density of the material will not be reached.

The adding of metal necessary to fill the space left after the thermit reaction can be done in the manner best suited to the facilities of a given plant, but in general several groups of ingots can be poured before bringing the ladle back to refill the first ingots. In order to make the cover tight care must be taken that no metal is spilled on the upper surface of the crust, and that the hollow space is only filled to the lower edge of the crust. Any space between the cover and the ingot mold should be made air tight with moist sand, to prevent the escape of any metal forced up in cooling.

The can should not be introduced too soon, as the separation of the gases takes place just before the solidification of the metal. If the introduction is not made at the proper time this fact will be clearly indicated, as there will be no sinking of the metal in the mold. If, however, the can is introduced at the proper time, as determined by repeated experiments, the sinking of the metal in the mold will occur every time.

*Dr. Beck, the author of the paper, not all of which is here printed, is metallurgist of the Goldschmidt Thermit Company.

There is no danger that any parts of the thermit slag will remain in the interior of the ingot. Many of the ingots treated with the anti-piping thermit have been rolled into sheets and plates, and any detrimental amount of slag in the steel would certainly have made an appearance in the finished product. In most cases the second pouring can be arranged without difficulty, but if this should not be possible, the empty space between the solidified crust and the surface of the ingot should be filled with dry sand, as already mentioned, and the covers put on in the usual way. Although some steel-works do not add the extra metal, claiming that a sufficiently improved quality of material is obtained without doing so, it should be done wherever possible, as it adds materially to the amount of finished product per ingot.

In small ingots the cost of the treatment amounts to about 35 cents per ton in the open-hearth department;

against this there is an estimated saving of about 75 cents per ton in the rolling department. In large ingots (about 8 tons and more) the cost of the treatment is only 20 cents per ton and the saving is the same as in a small one.

A still further saving, which could not be calculated exactly, will be derived from the decreased percentage of defective plates, which is cut down to about 0.3 per cent, according to Dr. Canaris. In this case all plates which do not give the required dimensions or have not the desired physical properties in the head are classed as defective. Untreated ingots of the same group are often not uniform. Frequently there is a sound ingot, which will give good results without thermit treatment, and next to it there may be one with a large pipe or blow-hole. Uniformity is secured by the thermit treatment.

An Explanation of the Talbot-Method Solid Ingots

LATE DISCUSSIONS OF THE PROCESS.

Since the informal meeting of the Iron and Steel Division on November 7, 1912, at which Benjamin Talbot, of Middlesbrough, England, then in this country, described his process of producing solid steel ingots, additional discussion has been received by the Institute and the original paper together with the main points of the earlier as well as the later discussion was presented at last week's meeting. A full report of the meeting devoted to the Talbot paper was given in *The Iron Age* of November 14, so that it suffices to draw at this time from the written contributions, one of which was from Prof. Henry M. Howe and the other from H. D. Hibbard, Plainfield, N. J. Mr. Talbot has also written since the November meeting and some of his supplementary information as well as the sketch and accompanying explanation submitted at that meeting by Max H. Wickhorst, engineer of tests of the American Railway Engineering Association, Chicago, are also given in the following review:

Dr. Howe's Explanation of the Process

Dr. Howe: In the blooms and rails which result from Mr. Talbot's process there are three well marked layers, the shell, 1, in Fig. 1; the ring, 2, and the core, 3. The shell is of about the normal ladle composition. The ring is greatly enriched in the three segregating elements, carbon, phosphorus, and sulphur, and the core is correspondingly impoverished in them. Manifestly something has happened to transfer these segregating elements from the core to the ring. What is it? If we put together the remarks made by several gentlemen, especially Mr.

Stoughton and Mr. Kenney, and supply some missing links, I think we have a fair explanation.

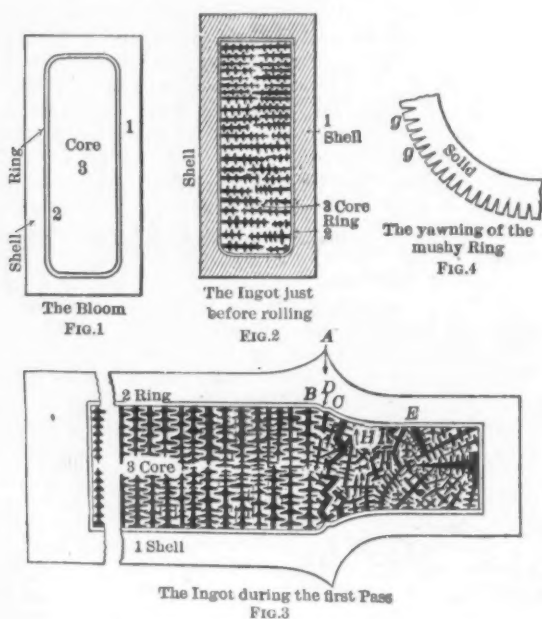
First we must recognize that because of the thorough deoxidation which Mr. Talbot uses there would be very little segregation if the ingot were left undisturbed, and solidified in the normal way without compression by Mr. Talbot's process or in any other. In other words, the solidification is of that exaggerated landlocking type which was noticed in the early use of aluminum. The metal produces the impression of solidifying suddenly from shell to core, which means that, because of the stillness caused by the suppression of the gas convection currents by the deoxidizer, pine-tree crystals shoot out into the molten mass very far in advance of the actual completion of solidification. Fig. 2 may show the condition of affairs diagrammatically after solidification has progressed a certain distance. Here we may recognize three tolerably well defined concentric layers, 1, that part of the crust in which solidification has gone so far that the metal is strongly coherent and does not fissure when elongated by the forward pull of the rolls; 2, the ring in which the metal is in the mushy stage between grass and hay, when it has neither the cohesion of the solid layer 1 nor the mobility of the core; and 3, the core, which is a veritable sponge, composed of dendrites of purer material interpenetrating the still molten and less pure metal. This is the condition of things when the first pass through the rolls occurs, and because of this arrangement that pass and the succeeding ones transfer this still molten and less pure metal out from between the dendrite trunks and branches to the ring, as I will now try to explain.

As any given transverse section of the ingot enters the rolls, the first stage of the effect caused in it by the rolls is shown at A in Fig. 3. This is in effect a powerful compression. On the inner face of the shell the metal at C is forced backward toward that at B, and this compression would naturally squeeze in the direction of the arrow D part of the less pure molten metal locked up between the purer and more solid parts of this layer. Thus comes about a first enrichment of the ring, and of that layer of the spongy core in immediate contact with that ring. Impure, less firm metal is forced from the inner part of the shell into the ring, and from the ring into the adjacent part of the core.

In the second stage of the action of the rolls, from C to E, the shell is elongating. But the metal in the ring will not elongate because it is in the mushy incoherent stage in which any attempt at elongation simply tears it open. Because the shell is elongating rapidly while the ring is not, the metal in the ring tends to gape open in minute cracks as sketched diagrammatically in Fig. 4.

But while the ring is thus cracking open in thousands of minute cracks, it is pressed strongly down upon the spongy core.

If we press a glass plate down upon a sponge filled with ink, we drive that ink out of the pores of the sponge into the relatively open space between the sponge and the glass plate. If we have a long cylindrical ink-wetted



Diagrams of Prof. Howe's Explanation

sponge which roughly fills the interior of a test tube, and if we then press down on top of that sponge with a plug that fills the bore of the test tube closely, so that the ink cannot rise past it freely, in like manner we squeeze the ink from the pores of the sponge into the space between the sponge and the glass. In like manner between the solid walls of our ingot there lies a sponge, consisting of purer dendrites between the boughs of which is the residual still molten impure metal, that which when later revealed by the sulphur-print blackens like ink. The radial pressure of the rolls crushes this sponge down into a mass of distorted trunks and branches, bent back and doubled on each other, and expels from its pores and toward the surface of that sponge the molten impure metal. This outward movement of this impure molten metal is greatly exaggerated by the fact that at this very instant the little cavities shown at *g, g, g* in Fig. 4 are just opening, so that it is as if, at the instant when we press down on the stopper in our test tube, we simultaneously converted its inner face into a bibulous sheet of blotting paper, full of fast-growing pores, which suck up the outward squeezing ink.

Thus the tearing open of numberless little cavities in the inner face of the ring at this instant, because that incoherent face cannot elongate with the shell to which it is integrally attached, furnishes a haven for the outward-pressing impure molten metal which the radial pressure of the rolls leads to travel in the direction of the arrow *H*. That pressure forces the relatively coherent immobile dendritic branches centripetally, and because of that centripetal movement of the less mobile branches the more mobile impure molten between them migrates centrifugally as shown by the arrow *H*.

The entrance of these centrifugally traveling molten particles from the outer part of the spongy core into the yawning cavities in the ring, makes way for the like centrifugal travel of the deeper-seated particles of the molten, lying nearer the axis of the ingot. At the next pass the ring itself is torn open in like fashion, and into these new cavities as they open the deeper seated parts of the impure molten are now squeezed, so that each squeeze of the rolls carries farther this squeezing of the impure molten from deeper and deeper seated layers of the core into the recurring cavities in the ring.

Thus is the ring enriched in the segregating elements at the expense of the core, which is correspondingly impoverished or purified. If this is not the whole story, it seems to be a large part of it.

Mr. Hibbard's Observations on Piping and Segregation

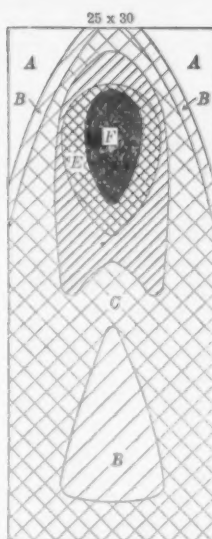
Mr. HIBBARD: It should be remembered that steel pipes from physical rather than from chemical causes; that is, from the contraction of the metal as it loses heat, and also because the outside of the ingot is cooler than the inside. Therefore the cure should be physical or mechanical. If the ingot lost heat at a uniform rate throughout, the pipe would undoubtedly be smaller if not wholly absent. Many plans proposed for doing away with pipe have been futile because they were not continuous acting.

In a certain sense Mr. Talbot's plan is continuous because the several passes through the rolls may each be curative of the pipe already formed up to that time. There is likely to be some tendency to form pipe, however, after the last of the preliminary passes when, as apparently must be the case sometimes, a part of the interior is still liquid. The plan may do well in actual work, nevertheless, as things sometimes do which are not ideal or are even unmechanical.

The mother liquor, containing more than the average contents of the various steel ingredients, is squeezed out from the purer solid or near-solid material, as water is squeezed from a sponge, and the purer center results. This shows that segregation is really a worse thing than has been heretofore usually believed. Drillings from the segregated part of an ingot are probably always diluted by some of the purer metal intermixed, so that their analysis does not tell how impure the true segregate really is.

Mr. Wickhorst's Survey of a Bessemer Ingot

Mr. WICKHORST: Our survey of ingots has shown that there is generally some negative segregation in the interior and lower half of the ingot; that is, the metalloids, carbon, phosphorus and sulphur, are below the average



Mr. Wickhorst's Diagram

of the steel as poured from the ladle. The well-recognized positive segregation or concentration of these elements occurs in the interior and upper part of the ingot. There is also more or less tendency of the upper and exterior portions of the ingot to show negative segregation. When sufficient deoxidizer has been used, such as silicon or titanium, we do not find the usual spongy or porous condition of the metal in the upper part of the ingot, but when cast in ordinary open-top molds in the usual manner the interior shows the negative segregation in the interior and lower part of the ingot, and some positive segregation around the pipe, but not concentrated to the same extent, due perhaps to the metalloids not being able to concentrate into so small a volume on account of the presence of the large pipe; that is, instead of being concentrated close to the axis, they are distributed around the pipe something like a ring. Such deoxidized metal also seems to show less negative segregation in the upper corners of the ingot.

In this connection I present as interesting a diagram showing the distribution of phosphorus in a large Bessemer ingot about 25 x 30 in. at the bottom and 58.5 in. high, that weighed 10,600 lb. The average composition of the steel was: Carbon, 0.54; phosphorus, 0.093; sulphur, 0.035; manganese, 0.99; silicon, 0.13. The phosphorus content in the various areas was as follows: *A*, below 0.070; *B*, from 0.070 to 0.085; *C*, from 0.085 to 0.105; *D*, from 0.105 to 0.135; *E*, from 0.135 to 0.175; *F*, above 0.175. With smaller ingots the separation was not as marked, however, as in the one shown.

Mr. Talbot on Large Scale Operations with His Process

Mr. TALBOT: In the discussion on my paper very great surprise was shown at the fact that in the sulphur prints exhibited there was a regular area of higher carbon and sulphur metal upon the inner wall of the solid envelope, and a purer center inside that. Further experiments have shown that the formation can be consistently relied upon. One of the members looking at the sulphur-prints thought that there might be a distinct cleavage in the metal, whereas there is nothing of the kind, there being a gradual gradation of one structure into the other.

As to the steelworks casting department, I may say that in my opinion the present ordinary methods have to be revised and the casting must become an important department of steel manufacture. To-day both metallurgists and works operators have neglected this department and have not considered it as of anything like the same importance as the actual manufacture of the pig iron or the conversion of the iron into steel.

If liquid compression of the ingot is to be adopted, steel furnaces must not be allowed to "bunch" together, and to tap a large number of heats at once as is the present practice. If a continuous set of rolls be used for liquid compression, then such rolls must be equal to dealing with the maximum quantity of steel tapped in any given time, but speaking as a works engineer and practical operator I see no difficulty in designing a plant to squeeze the required number of ingots to keep a modern rail mill supplied.

Assuming that the necessary preparatory treatment has been made, we find that the size of the ingot must be standardized when such treatment is used, and a 4-ton ingot seems to be a most useful size in this respect.

Finally, in my opinion the characteristic structure developed in rails, treated by my squeezing process, must cause these rails to be better than rails from the upper portion of ingots from ordinary heats which are always more or less segregated in the center. I hope to give full details of the results we have obtained in a paper to be read before the Iron and Steel Institute in London next May. I was under promise to give this paper before I visited America last year.

General Discussion of the Papers

Prof. Albert Sauveur, professor of metallurgy, Harvard University, opened the discussion. He expressed pleasure in the evidence which the meeting bore of the substantiation of views he had expressed twenty years ago, when one-tenth of the ingot was cropped, instead of one-third, and as a result of which about one-seventh or one-sixth of the rails rolled were defective. It was then charged that he was exaggerating the effect of piping. It was now reassuring, he added, that there were five or six processes for improving steel ingots practical from the cost standpoint, and he believed the meeting would make itself felt far and wide.

Does Not Favor Specifying Definite Discard

Robert Job of the Milton Hersey Company, Ltd., Montreal, and chemist of the Lehigh Valley Railroad, was the first to refer to the four questions or topics under which it had been suggested the general discussion could be had. To question No. 1, "Is the present method of getting rid of the pipe by cropping a safe and reliable device for making sound steel?" he said that in good mill practice there is not much piping, while in poor mill practice, 50 per cent. cropping would not avail of much. Question No. 2 he covered in answering No. 1, that is, "Is it desirable to increase the amount of metal arbitrarily cropped off the top of an ingot, and, if so, what would be a fair excess price to pay for cropping off 20 per cent.?" Instead of specifying a definite discard one should not penalize good mill practice, but let the mill decide. He described the rail tests for the Lehigh Valley Railroad, which are made at the rail mill for each ingot without hindering the mill operation. If the drop tests are not met, the three or four rails from the ingot are rejected. In replying to the third question, he felt that it is, "Commercially practicable to make ingots without pipes or blowholes," but he did not express himself specifically with regard to the latter part of the question—"What additional expense of manufacture would be justified to accomplish this result?" Finally, he agreed that too much attention cannot be paid to the thorough deoxidation of the steel, as Dr. Dudley had described, and he felt that the Dudley ductility test is an excellent one.

Max H. Wickhorst, engineer of tests, rail committee, American Railway Engineering Association, Chicago, said that 95 per cent. of the rail failures were, so far as visible appearances go, attributable to head failures, from internal splits and so forth; failures of the base with the so-called moon-shape breaks; broken rails throughout the whole section and sometimes called square or angular breaks. About one-half of the rail failures he said occurred in the head, and were traced generally to a poor condition of the ingot, though heavy segregation more often than piping was the cause of trouble.

Compression of Crucible Steel Ingots

L. E. Howard, Simonds Mfg. Company, Lockport, N. Y., described briefly his success with the compression of crucible steel ingots. In this process, the steel is cast in split molds, and as soon as possible, is removed to what is a compressing die, which acts as the metal solidifies. In a brief reference to the process, which has not yet been described at length, he intimated that considerable care had to be taken in handling the fresh ingot, as it is removed from the casting mold as quickly as possible, that is, when the skin is rather thin. The first ingot experimented with weighed 15 lb., and the ingot size was later increased to 50 and then to 200, and now to 600 lb., and designs are being put forward for 1500-lb. and even 3000-lb. ingots. As regards question No. 3, he felt that it is commercially practicable to make ingots without pipes at least so far as one year's experience goes with crucible steel at Lockport. He had said that the cost of the experiments was no more than 2.6 per cent. of the value of the ingots experimented with.

J. E. Sague of the Public Service Commission of the Second District, New York State, Albany, N. Y., agreed that the railroad and the locomotive builder had placed extreme severity on the rails, and hardness of rail had been increased until President Farrell of the United States Steel Corporation and President Clarke of the Lackawanna

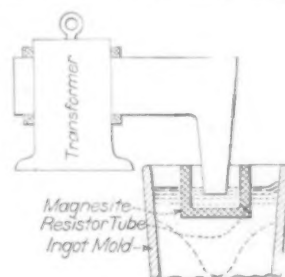
Steel Company, affirmed that the tendency must now be toward the softer rail. He felt that restriction on speed was the most important question to be considered and that the two railroads which had put their 18-hr. New York-Chicago trains on a 20-hr. basis had done a great service in face of the criticisms of their high-speed patrons. One cannot count definitely on safety with high speeds in all sorts of weather.

Henry D. Hibbard, consulting engineer, Plainfield, N. J., described at some length the process of Sir Robert Hadfield, in which some 20,000 tons of steel had been made and not one unsound ingot had been found.

W. C. Cushing, chief engineer, maintenance of way, Pennsylvania Lines, Southwest System, Pittsburgh, mentioned particularly the value of milling the ends of rails to ascertain signs of defects rather than depending on the inspection of saw cuts, as practised generally in the United States. He said that 60 to 70 per cent. of the total rail failures occurred in the head; 5 per cent. in the web; 5 to 10 per cent. in the base, and 20 to 25 per cent. were broken rails. He said there were less failures in the base since the base had been made larger. Europe, he added, had confounded broken with defective rails in its analysis of conditions in this country.

Suggested Method for Preventing Pipes

G. H. Clamer, Ajax Metal Company, Philadelphia, proposed a method based on the principle on which the Hering electric furnace is operated, namely, the produc-



Method to Prevent Pipe by Electric Heating

tion of heat in a body of liquid metal, the dimensions of which are so restricted that a current of high current density flows through it, producing the pinch effect, which automatically expels the metal from the center of such restricted body of metal, causing it to flow in gradually around the periphery of the ejected core of liquid. Experiments conducted in a small furnace

of this type have been so satisfactory that four furnaces are now under way, ranging in capacity from 1 to 3 tons. The device as here shown consists merely of transformer directly connected with metallic electrodes and a block of magnesite in which the resistor holes are placed. It will, of course, be necessary to prepare a shield to protect the transformer from the heat given off from the cooling ingot. It has been calculated that transformers with capacity of 10 to 50 kw. would take care of practically all commercial sizes of ingots. The current is transformed from one of 110, 220 or 440 volts, to one of 4 to 6 volts, with a corresponding increase in the amperage.

N. Petinot, Titanium Alloy Mfg. Company, Niagara Falls, N. Y., claimed that while aluminum is the most powerful of all deoxidizers known, the resulting alumina melts at 210 deg. C. and consequently is infusible at the temperature of the bath, and will stay in the steel. If some part of it by chance is near the top of the ingot, it will, he added, cover the surface of the pipe and immediate rolling, as suggested by Mr. Talbot, will not have any advantage. Silicon is left in part in the steel, and if as a silicate it is very harmful. Titanium in amounts of 0.05 to 0.10 per cent. will not necessitate any extra deoxidizer and is the only cheap deoxidizer known and can be used without danger of leaving its oxidation products in the bath of steel. Silicon, which is a cheap deoxidizer, ought to be used moderately, and then the deoxidizing completed by titanium, which will reduce the iron silicates formed in the steel by the previous introduction of ferro-silicon.

Dr. Henry M. Howe, in admitting that it is desirable to retard the cooling of an ingot at the top and that one might well use a mold heavier at the bottom to absorb the heat more rapidly from the molten metal at the bottom, suggested possibly that the last part of the ingot might be poured more slowly or that one might return some min-

utes later to the molds already filled; say, in the case of the Bessemer product, with steel from the next heat. He hinted that possibly the suggestions have already been answered by mill men. The ingot cast from the bottom represented, he added, the worst possible conditions compared with casting at the top with the large end uppermost. Casting with so-called live steel results in blowholes, and therefore segregation. Into the blowholes what Mr. Hibbard has called sonims are squeezed and are there concentrated and cause streaks or defects in the resultant rolled material.

Karl W. Zimmerschied, metallurgist, General Motors Company, Detroit, Mich., spoke for the automobile industry which uses bar steel and encounters troubles due to pipe, sonims and blowholes. The industry suffers particularly from segregated non-metallic material. In referring to the questions which had been propounded, he considered that it is possible to get rid of pipe by cropping to get a sound steel, but an inspection of the cool metal is

necessary, as the lipped end of cold billets show whether there is pipe and sometimes the segregation can be discovered. He considered it out of the question to increase arbitrarily the amount of discard from an ingot. As regards the use of deoxidizers, he felt that contrary to the claim that alumina is not always self-removing and helps to become one of the troublesome impurities it is lighter than titanium oxide even if it does solidify and therefore will rise rapidly in the ingot. As regards question No. 3, he felt that it is commercially practicable to make ingots without pipes. He ventured the suggestion that the ingot be split while hot and then one would know exactly what steel to eliminate and what not.

Among others who discussed the papers were James E. Howard, engineer-physicist, Bureau of Standards, Washington, D. C.; Dr. Allerton S. Cushman, director of the Institute of Industrial Research, Washington, D. C.; Bradley Stoughton, New York; Henry Hess, Philadelphia, and Charles Kirchhoff, who presented the paper of Mr. Talbot.

The New President and Secretary

Charles F. Rand, President

Charles F. Rand, who has been elected president of the Institute, received the compliment of a unanimous vote, which is particularly gratifying since there were several tickets in the field for secretary and at least two for directors. Mr. Rand was born in Maine in 1856. After completing his education his first active business was as auditor and treasurer of the Milwaukee, Lake Shore & Western Railway Company. He severed his connection with this road in 1886, at which time he went into iron mining, with offices later at Cleveland, continuing until 1899 the executive officer and manager of the Aurora Iron Mining Company of Ironwood, Mich. He had charge likewise of several other iron mines in that section. In this period he was called upon to be receiver of the Penokee & Gogebic Consolidated Iron Mines, which he reorganized and placed upon its feet as the Tilden Iron Mining Company, in whose management he was active until its absorption by the Carnegie Steel Company.

Mr. Rand's principal business in later years has been in connection with iron and manganese mining in Cuba. Since 1893 he has been the president and general manager of the Spanish-American Iron Company, operating in Santiago de Cuba, having just completed his twentieth year as its president. In this time he has built railroads, harbors, electric power and sintering plants and constructed two model towns, so that these Cuban mines have become famous not only for equipment and efficiency of operation but for the care exercised in the housing and protection of laborers. Mr. Rand was the discoverer of the great soft iron ore deposits of the north coast of Cuba and acquired the mining rights and surface rights to the Mayari mines—about 40,000 acres. He is president of the Ponupo Manganese Company, owning the Ponupo manganese mines near Santiago de Cuba, also the El Cuero iron mines in the same district. In his Cuban operations he has acquired for himself and the companies he represents the ownership of 2,000,000,000 tons of soft iron ores.

Mr. Rand's name is associated also with the development or operation of important enterprises on the Pacific Coast. He was an executive officer of the Monte Cristo mines in the State of Washington and of the Puget Sound Reduction Company, which owns the smelter at Everett, Wash., and in 1902 with others he organized the Federal Mining & Smelting Company, operating in the Cœur d'Alenes.

He is a member of the Chamber of Commerce of New York, the American Iron and Steel Institute, the Iron and Steel Institute (London) and several other technical societies. During his term as director of the American Institute of Mining Engineers he has been most active in its affairs and as chairman of the finance committee has been largely responsible for the present satisfactory condition of Institute finances and for economies which have had the cordial approval of the officers and directors of the past two years.

Bradley Stoughton, Secretary

As secretary of the Committee of the Iron and Steel Division, Mr. Stoughton has had an important part in the excellent work of that committee in the past year in reviving interest in the institute among iron and steel works engineers. He has an enviable record in iron and steel metallurgy as instructor, author and consulting engineer. Few men of his age have become so well known in that field. He was born December 6, 1873, in New York City. He was graduated from the Scientific Department of Yale University with the degree of Ph. B., in 1893, and from the Department of Mining and Metallurgy of the Massachusetts Institute of Technology with the degree of B. S., in 1896. For about a year Mr. Stoughton was an assistant instructor in the Massachusetts Institute of Technology in the Department of Mining and Metallurgy and thereafter for five years was engaged practically in the manufacture of steel, most of the time as a metallurgist or superintendent. He turned to teaching again and for four years was adjunct professor of metallurgy of the School of Mines of Columbia University, part of this time being acting head of the Department of Metallurgy and also practicing as a consulting metallurgist.

"Metallurgy of Iron and Steel," Mr. Stoughton's most permanent literary work, a volume of over 500 pages, which appeared in 1908, ran into the third edition in the first year and has been adopted as a text-book in several of the principal colleges and universities of the United States and Canada. All told, he has probably written 100 papers on iron and steel and metallurgical subjects. He has given much attention to and advanced the art of photographing metal structures, and presented a report on that subject to the International Congress of Mines and Metallurgy at the World's Exposition at St. Louis. His articles are familiar to readers of foreign technical journals as well as those of this country. For three years of his connection with Columbia University he was a partner of Prof. Henry M. Howe, under the firm name of Howe & Stoughton, consulting metallurgists. Of late years he has devoted himself to his profession of consulting engineer and in the last two years has given much time to research in heat treatment of steel and in the uses of titanium in steel making. One of his contributions to the practical side of steel manufacture was the invention of the Stoughton side-blow converter for steel castings, which has been adopted by the United States Navy and by many steel foundries in this country and Canada. He has designed and built and has operated steel plants.

Mr. Stoughton is a member of the Mining and Metallurgical Society of America, International Association for Testing Materials, Iron and Steel Institute, American Society of Mechanical Engineers, American Foundrymen's Association, American Foundry Foremen's Association (honorary), and American Society for Testing Materials.

(Continued on page 569)

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CONTENTS.

Steel Castings Without the Use of Manganese.....	527
A Heavy Duty Motor Truck Axle Turning Lathe.....	528
New Type Back-Bearing Power Press.....	529
The Motor Truck as an Economical Tool.....	530
A New Style of Duplex Milling Machine.....	531
New Annealing Furnaces at Midvale Works.....	531
Steam-Accumulator Regenerators.....	532
An Interesting Safety Device for Tilting Carboys.....	533
A New Portable Electric Drilling Machine.....	534
A Profiling Machine with an Automatic Feed.....	534
No Tonnage Tax on Lake Ores.....	534
Belt-Driven Grinding and Polishing Machines.....	535
Combination Offset Boring Head and Drill Chuck.....	536
Combination Flanging and Shearing Machine.....	536
Interstate Commerce Commission Action.....	537
Npt Limited to Local Insurance.....	537
New Sensitive Bench Drilling Machines.....	537
A Symposium on Sound Steel Ingots.....	538
Mill Treatment and Ductility Tests of Rail Steel.....	539
Proportions of the Mold to Make Sound Ingots.....	541
Some Specification Rails Made in Different Mills.....	544
The Use of Thermit in Casting Steel Ingots.....	545
An Explanation of the Talbot-Method Solid Ingots.....	546
General Discussion of the Papers.....	548
The New President and Secretary.....	549
The Speculative Factor.....	550
The Mexican Situation.....	551
The Editorial Service Given Our Readers.....	551
Efficiency in the Office.....	552
Factory Rules.....	552
Correspondence.....	552
More Workers Needed at Lake Iron Mines.....	553
Strikes in the Foundry Trade.....	553
New Chinese Iron Enterprises.....	553
The Pressed Steel Car Company's Year.....	553
The Iron and Metal Markets.....	554
Personal.....	566
Obituary.....	567
Pittsburgh and Vicinity Business Notes.....	568
Canada's New Steel Center.....	568
Alabama Consolidated Reorganization.....	568
Continuation Schools Urged for New York City.....	569
Book Reviews.....	570
Franklin Institute Gold Metal Awards.....	570
Spelter Production in 1912.....	570
New Tools and Appliances.....	571
The Machinery Markets.....	572
Trade Publications.....	580

The Speculative Factor

Karl Wittgenstein, long a leader in the Austrian steel industry, whose death after 15 years of retirement was recently recorded in these columns, was commonly referred to in the days of his prominence as "the Austrian Carnegie." He had uncommon insight and in coping with trade problems was decisive and courageous almost to the point of daring. While an ardent champion of the cartel system, he was by no means friendly to dead level conditions and believed that full play should be given to individual initiative. He was sincerely appreciative of American achievement in iron and steel and believed that the willingness of the American manufacturer to adventure on uncertain ground was the explanation of some of his conspicuous successes. In an address at an important gathering of manufacturers he thus stated his creed on this point:

A man lacking the speculative mind, a manufacturer without the capacity for taking into consideration, besides the visible moments, also the uncertain ones lying in the future, and of coming to corresponding decisions, even at the risk of having events turn out quite differently, is unfitted for the management of an industrial establishment.

The earlier days of the American steel industry were marked by more than one development which forced manufacturers to decisions involving large risk of having events turn out at variance with their forecasts. The introduction of the Bessemer process and later of the open hearth process forced decisions which on the one hand led on to fortune and commanding position in the American steel trade and on the other hand to declining prestige and finally to heavy loss. The important changes of more recent years have come gradually enough, for the most part, to permit of adjustments that avoided disaster. It may be recalled that the Steel Corporation was not more than two or three years old when some of the wisecracks of consolidation finance predicted a tremendous depreciation in its property valuations because of the great Bessemer capacity that must shortly be scrapped to give place to open hearth. The revolution has come, it is true, and it has been more sweeping than most leaders in the trade could have predicted 10 years ago. But it has been gradual enough to make the hurt almost negligible in the case of the Steel Corporation, and elsewhere the duplex process has cushioned the fall of the Bessemer and greatly reduced the actual destruction of plant.

On the commercial side of the steel industry the tendency in the first decade of the consolidation regime was toward the elimination of speculative factors. The maintenance of prices of leading products on an even keel tended to reduce the number of variables and to put the consumers of iron and steel more nearly on a level in the cost of their material. While that has been changed in an important way by the developments of the past year and a half, there is still present the strong steadying and evening up influence that has kept prices on contract steel products practically at a standstill in the past six months.

In the higher development of the industry the tendency is toward a condition of greater safety from revolutions in practice and from extreme fluctuations in values. A feature of the steel manufacturers' movement for a better keeping of contract obligations of buyers is the shortening of the period of delivery, though manifestly in this matter much will depend on the relation of demand to capacity. When order books need filling and prices are lowest, it is a matter of

history that delivery periods are at their longest. However, it is the evident tendency, with the extensions of capacity chiefly made by large companies rather than by the entrance of new competition into the industry, to hold price advances in check, so that consumption may be kept nearest maximum and the down swings, in times of reaction, be shortened. Even if co-operation is permanently eliminated, self-interest will commit the large integrated companies to steadiness and the confining of consumers' speculative activities within bounds.

The Mexican Situation

The entire civilized world is deeply stirred over the recent lamentable occurrences in Mexico. Human life appears to be lightly regarded in that unhappy country. For two years contending factions have scourged the land, conducting merciless warfare against one another. Almost unceasingly since the downfall of Porfirio Diaz rival revolutionists or bandits appear to have been endeavoring to exterminate the adult population. The recent upheaval in the city of Mexico, instead of bringing about an immediate condition of tranquility, has resulted in ruthless acts of barbarism.

The possibility of attacks on foreigners now residing in Mexico, resulting from lawless conditions there, is causing frantic efforts to be made to our Government to intervene in the affairs of our Southern neighbor. Urgent appeals are made by European newspapers and by some American editors and politicians for troops to be sent to Mexico at once and endeavor to establish order. It is claimed that the Government should not wait until serious outrages against foreigners shall have been committed but that it should strike before such an occurrence. It is assumed that the United States occupies a position of responsibility toward European nations in this matter and that it should not hesitate to assume the responsibility and proceed to discharge its proper duties.

Thus far the Government has acted with commendable prudence in this matter. President Taft has shown his determination not to yield to clamor and to embark on an undertaking whose consequences it is difficult to foresee. Interference with the domestic affairs of Mexico could not be regarded as anything but an invasion. It would not be a triumphal march of a few thousand troops from the border to the principal cities, but it would be a series of arduous campaigns that would tax the resources of our military establishment. All factions of Mexico could then be reasonably expected to unite, forgetting their differences with one another, and with all the energy of which they are capable repel such an invasion. Lives of foreigners in remote localities of Mexico would hardly be safe for any length of time after the news of an invasion by the United States should reach the natives in those sections. All the hatred of the United States, which has been smoldering since the war of 1847-9 would burst forth in renewed fury. The intervention would have to be a merciless war of conquest. And what would be the result? After killing thousands of Mexicans and sacrificing the lives of more thousands of our own men, the people of Mexico would be brought no nearer to conducting a stable government than they are now. It would be necessary for the United States forces to continue to occupy Mexico for many years for the purpose of bringing about pacification, but retirement from the country even then would perhaps

be followed by struggles among rivals for political supremacy.

The action of our National Administration has so far been eminently wise and its policy should be continued by the incoming one. No interference with Mexican affairs should be made unless the lives of foreigners in that country are actually imperiled. The attacks on property by bandits should not be made the pretext for intervention there as they are not regarded as sufficient reasons for intervention in the affairs of any other country. The efforts of jingoes in America and of hysterical newspaper writers in Europe should not be heeded for a moment. While we may regard with horror the atrocities which have been committed, they are such as accompany revolutions in most countries, and out of them in time will probably come the development of a stronger government which can bring about peaceful conditions and a return to pacific pursuits.

Our business interests in Mexico are exceedingly great, our relations with the Mexican people have for several decades been steadily improving, and there is reason to believe that when that country emerges from its troublous times its great natural advantages will more than ever be turned to the benefit of our own citizens. Our interests lie in the cultivation of friendship and not in planting seeds of resentment which may continue to bear bitter fruit for numberless years.

The Editorial Service Given Our Readers

The making of the index for the last volume of *The Iron Age* led to some comparisons which may very properly be laid before our readers. They have to do both with the character and the amount of reading matter given in this journal in the past three years, or since the separation of the hardware department and its publication as a separate journal under the name of *Iron Age-Hardware*. By that separation all that pertains to the great machinery, foundry and iron and steel industries became the special text of *The Iron Age*, while the retail hardware trade and the important interests engaged in hardware manufacture and distribution have been strongly represented by *Iron Age-Hardware*.

One comparison in which our readers are interested is between a year's total of reading pages in the iron and steel and machinery section of *The Iron Age* before the separation of the hardware department, and the number of reading pages in a year's issue of *The Iron Age* since it has been on the present basis. We give the figures for the past five years:

	Pages
1908.....	*2,669
1909.....	*2,766
1910.....	3,098
1911.....	3,026
1912.....	3,132

*Reading pages exclusive of hardware department.

It thus appears that as against 2669 pages, or an average of 51 pages per issue, given to the iron and steel, machinery and foundry trades in 1908, *The Iron Age* last year contained no less than 3132 pages, or an average of 60 pages per issue.

The comparison is not complete without some reference to the character of the matter presented in the reading columns of *The Iron Age*. The canvass of our subscribers made two years ago, the results of which were given in our issue of April 13, 1911,

showed that a very large percentage of readers of this paper are proprietors, managers and superintendents of iron and steel works, foundries, machine shops and other metal working establishments. It was said then that the facts revealed by the canvass as to the positions held by the more than 38,000 regular readers of *The Iron Age* (an average of nearly three readers reported for each subscriber's copy) would be turned to account in determining what should go into its reading pages. Without diminishing in any wise the amount of attention paid to the fields long represented in these pages, the 20 per cent. increase in reading space, as shown in the figures above, has made possible a better treatment of the problems of the shop manager. A striking example of this was the monumental January 2 number of *The Iron Age*. While it had 33 pages on metallurgical subjects and iron and steel works developments—all apart from general news and market reports—42 pages were given over to practice in design and equipment of metal working plants, together with process descriptions, and 23 pages to the ever-present problems of industrial management.

The response to the increased editorial service given the readers of this paper in the past year has been most gratifying. It is entirely within bounds to say that never has *The Iron Age* been so widely or appreciatively read by the responsible men in the iron and steel and metal working industries as it is to-day.

Efficiency in the Office

The criticism is heard occasionally that in many industrial establishments the office is less efficient than the factory. The manager succeeds in putting his manufacturing departments on a highly productive basis, but the office has received less attention. The clerks who keep watch on the shop efficiency system may be inefficient themselves. The atmosphere of industry varies greatly comparing office with office. In some the concentration of effort is not only observed but is felt by the visitor. In others no keenness of endeavor is apparent. Clerks waste good time chatting together. A woman employee is busy on needle work. The office force seems unnecessarily large. A reduced staff would produce as much work under the same tension that exists in the factory, and probably would do it better, for slothfulness is apt to breed other bad habits.

Factory Rules

Many manufacturing plants have no printed schedule of regulations to govern the conduct of employees. Rules exist, but are passed on by word of mouth rather than in printed form. They should be posted conspicuously. In that way they are better understood, and ignorance cannot be urged as an excuse for infraction. They should be set forth as plainly and as briefly as possible. The tendency in formulating shop rules is to complicate them.

Usually nowadays foreigners make up a considerable element in the average shop and it is necessary to print the rules in the language of the various nationalities represented. In securing translations great care should be taken that they express the exact meaning of the original English. This is not always the case and owners are without means of checking up the work of the interpreter. The simpler the regulation the more certain his version, and special care is needed with those tongues which are less commonly

known, some of them being hardly more than dialects. The manufacturer setting out to prepare formal rules for posting in his works should have little difficulty in getting an excellent basis on which to go to work, for some of the larger companies have worked out this matter with infinite care.

Correspondence

What Constitutes a Machine Tool

To the Editor: On page 501 of your February 20 issue I see that the term "machine tools" has been "legally" defined. I wonder if anyone really knows now just exactly what a machine tool is. We in the trade probably have a more or less definite idea of the business in which we are engaged, but when we attempt to lay down a definition of our understanding the clouds begin to gather.

The definition of the expression "machine tools" as "a term applied to certain metal-working machines, particularly those in connection with cutters," is a very safe generalization, but just where would that stop? A metal cutting drill press has probably a clean title to the name "machine tool," but how about a ratchet drill, or any kind of a hand drill? Mr. Alford says "portability" comes in here—that any machine or tool that an operator holds in his hands or applies to his work without any mechanical support of any kind in the way of a bench, chain, stand or support except his hands is not a machine tool, but an "implement." That is the best definition that I have heard yet and seems to indicate a point in one direction where the "machine tool" stops and the "tool" or "implement" begins.

The customs court now says that the application of power to a metal-working device has a great deal to do with the classification of that device, and the case cited is that of a foot power lathe. Can it really be true that the arrangement of gears and pulleys and shafts of, and the various mechanical devices that when assembled make up a metal-cutting lathe—a machine tool—is really something else when a foot treadle is attached instead of a countershaft? By this process of reasoning, the household sewing machine is no longer a sewing machine when driven by an electric motor or set up in gang and driven from a power lineshaft.

The original purpose for which a machine was designed and built seems to have considerable bearing on its proper classification; but after an engine lathe is built and classified as a metal-working lathe (a machine tool, of course) is it no longer a machine tool in case a woodworker gets hold of it and uses it to turn up his woodwork: or if it is used by manufacturers of rubber rolls?

The term "machine tool" of course means something to the trade; but to anyone else it apparently has no definite meaning whatsoever—except lathes, planers, drills, etc. In other words, it is nothing but a trade expression.

There are undoubtedly some points on which we would all agree, perhaps on these three:

1. A machine tool is a metal-working machine.
2. Machine tools do not include rolling mill machinery.
3. The method of applying power does not in itself have any bearing on the subject.

What else can we agree on?

J. R. VANDYCK,

Vandyck Churchill Company.

NEW YORK, February 24, 1913.

Denial of a Reported Consolidation

To the Editor: Recently there has been, at different times, some comment on articles appearing in your worthy publication, stating that our company would combine its interests with some others. And we wish to now advise you, in an official way, that these rumors, definitely stating that we were a member of such intended combinations, have been absolutely incorrect; and there is no intent on the part of this company to merge its interests with others.

PHILLIPS SHEET & TIN PLATE COMPANY,
D. M. Weir, Vice-President.

WEIRTON, W. VA., February 21, 1912.

More Workers Needed at Lake Iron Mines

MARQUETTE, Mich., February 22, 1913.—As is the case in the Gogebic district and in some other fields, Marquette range iron mining companies have employment for additional workers. While some properties are operating with full crews, others are in need of 20 to 100 men, aside from those now in service. Additions of several hundred will be required when the Rogers-Brown interests and the Cleveland-Cliffs Iron Company resume operations in the Midgamme field. Men who will work underground have no occasion to be idle in the Marquette district this winter, as they can procure employment in almost any mine in which they desire to work. The Cleveland-Cliffs Company's Negaunee property, for one, is in need of miners, places for an increased force having been provided since the new shaft was put in commission a few months ago. The coming season will be a record-breaker for the range. More mines are active than for years past. The railroads are making preparations to handle an increased tonnage. It is believed that labor will be more plentiful in the spring, when many foreign-born workmen who have spent the winter abroad, are expected to return.

The action of the United States Steel Corporation in readjusting wages, especially those of surface men, an example followed by the other leading mining interests, naturally has caused much pleasure among the workers. The adoption of the new scale was entirely voluntary, no demands having been made. It is doubtful if mine workers anywhere are accorded better treatment than in the Lake Superior country, and the conditions under which they work also are probably more favorable. The principal companies are doing everything possible to prevent casualties. Since the eight-hour day was introduced in various districts the men affected have been better satisfied than ever. The better class of miners are receiving as large checks as they ever did and underground men with little or no experience also are paid well. In past years contract miners and trammers would receive only what they earned under the terms of their agreements, while under the present system miners who are unfortunate are guaranteed a minimum wage rate.

Strikes in the Foundry Trade

About 40 molders employed in the foundry of the Oscar Barnett Foundry Company, Newark, N. J., are out on a strike. The local molders' union made an assessment on its members employed in the Oscar Barnett foundry to aid in carrying on strikes at the plants of the Lidgerwood Mfg. Company and the International Steam Pump Company. Some of the men refused to pay it and the union asked the company to deduct the assessment from the wages of such men. The strike followed the company's refusal to do this.

Molders employed by the Pierce, Butler & Pierce Mfg. Company at Syracuse, N. Y., are out on a strike. A new agreement between the molders' union and the company was under consideration and the union insisted that it be made to include men employed on radiator work, whereas the agreement which was about to expire applied only to molders engaged on boiler work. As the radiator work requires less skill and a good many handy men are employed, the company refused to unionize that part of its shop.

New Chinese Iron Enterprises

The Daily Consular and Trade Reports learns from Japanese sources that one of three blast furnaces to be erected at the Pengchihu iron works in Manchuria, near Liaoyang, which has been started by Okura & Co., Tokyo, has been completed and the manufacture of pig iron is to be started shortly. The materials for constructing the furnace were supplied by the Imperial Steel Works at Wakamatsu, Japan, and all the pig iron produced is to be delivered to Wakamatsu. When the Pengchihu plant is completed, the annual output of pig iron is estimated at 120,000 tons. It is also reported that the Germans at Tsingtau intend to build iron works in which Chinese capital will be allowed to participate. It is proposed to start on a large scale, with a capital of \$10,000,000 to work ore from Chinlingchen, which is near the Shantung Railway.

The Pressed Steel Car Company's Year

Gross Sales Increased \$7,688,339 in 1912
But Net Profits Increased Only \$77,507

The fourteenth annual report of the Pressed Steel Car Company, covering the operations of the fiscal year ended December 31, 1912, enables the following comparison to be made with the business of the preceding year:

	1912	1911
Gross sales	\$19,019,403	\$11,331,064
Net profits	\$970,343	\$892,836
Preferred dividends	875,000	875,000
Surplus	\$95,343	\$17,836
Previous surplus	7,364,841	7,347,005
Total surplus	\$7,460,184	\$7,364,841
In 1912 expenditures for repairs and renewals were \$315,267.		

The general balance sheet, as of December 31, compares as follows:

	1912	1911
Assets		
Properties and franchises.....	\$27,093,200	\$26,947,062
Securities owned	2,936,835	2,961,170
Taxes and insurance not accrued	34,734	14,060
Accounts and bills receivable....	2,031,139	2,005,120
Materials on hand	2,569,842	1,147,973
Cash	1,266,053	1,515,532
Total	\$35,921,803	\$34,590,919
Liabilities		
Common stock	\$12,500,000	\$12,500,000
Preferred stock	12,500,000	12,500,000
Purchase money mortgages.....	.....	75,000
Accounts payable	2,257,329	1,018,711
Salaries and wages	185,539	113,616
Accrued preferred dividends....	218,750	218,750
Reserve for contingencies.....	800,000	800,000
Surplus and undivided profits..	7,460,184	7,364,841
Total	\$35,921,803	\$34,590,919

The following extracts are taken from President F. N. Hoffstot's accompanying remarks:

"The plants were operated continuously throughout the year, but on a reduced schedule, owing to restricted car buying by the railroads, and during the last quarter, when work was more plentiful, on account of delays in securing materials, the sudden and unprecedented demand of the metal trades covering a wide range of manufacture, having overtaxed the capacity of the mills and foundries.

"The increased activity in car buying the last three months of 1912, exceeding largely any similar period for several years, presents a more favorable situation for the new year and encourages us to believe that during the present year we will enjoy a greatly increased volume of business. The margins of profits are not large, as competition is exceedingly keen, but the situation bears a healthy tone. The orders during 1912, which were taken largely in 1911, were executed on an advancing labor and material market, and this, together with the restricted volume of business, accounts for the reduced earnings.

"The purchase money mortgage on the Allegheny plant of \$75,000 was paid off in June last, so that the company is now free from any mortgage indebtedness.

"The Fidelity Land Company's houses have been better occupied than ever and the tenants have enthusiastically supported the management's efforts to care for and make their homes attractive. During the year prizes were awarded for the best kept gardens, and it is gratifying to note that the facilities offered by the company for amusement and instruction of its employees and their children have been well received.

"The output of the passenger car department during 1912 was the largest in volume since its installation in 1905, and with the increasing demand for all-steel passenger equipment we hope to keep this plant in full operation and secure maximum production. The department is well balanced and is kept in the highest state of efficiency.

"The ten-year lease on the Western Steel Car & Foundry Company being about to expire, negotiations were entered into and completed for the purchase of this plant on the basis of a small cash payment and the assumption of an existing mortgage maturing in 1942."

The Standard Aluminum Company, Two Rivers, Wis., is contemplating the establishment of an aluminum rolling mill in connection with its pressing and stamping works. William Bremer, superintendent, is visiting Eastern works to obtain ideas. The intention is to import aluminum ingots from France.

The Iron and Metal Markets

New Western Bar Contracts

Inquiry from the Agricultural Machinery Companies

Canadian Buying of Plates and Shapes—More Inquiry for Pig Iron and Lower Prices

The reports steel manufacturers make as to business actually going upon their books or in prospect are still in contrast with sentiment expressed in other quarters, in which there are some notes of apprehension. It is expected that the Steel Corporation's unfilled orders will show a somewhat greater falling off in February than in January, but the extent of the gain on piled up contracts has not abated in the least the clamor of consumers for material.

An important development of the week is the appearance of inquiry from agricultural implement and machinery companies for their bar requirements from July 1 on. This business usually does not come out until April. But recently some of these works have had trouble getting needed supplies of bars, and their new contracts will be promptly followed by good sized specifications. Malleable foundries have also fallen behind on deliveries of agricultural castings.

The prosperity of this industry which reflects agricultural conditions, added to the record demand from the railroads, confirms steel producers in the predictions they have been making for later months of the year.

The Chicago district is still the center of highest pressure, the demand upon the leading mills for finished products being much beyond existing pig iron and steel capacity and shipments of pig iron from Pittsburgh to Chicago promise to continue.

Canada has been a heavy buyer of plates, shapes and bars in this country in the past week. More Canadian rail inquiries have come up also, the mills there being practically sold for the year. China will also place further rail contracts with American mills.

New structural contracts have been of only fair volume, but the total of work actually in sight is again above 250,000 tons. This fact may help to stiffen fabricators' prices which have been wobbling lately, with evidences of keener competition, particularly in the Chicago district, where more work can be handled that has been offering.

Conditions as to plates in the Eastern market are rather easier. One important mill can furnish universal plates in three to four weeks. Some offerings of tank plates from a Central Western mill are reported in Eastern territory at 1.40c. Pittsburgh, deliveries at the convenience of the mill.

The extent of the demand upon girder rail mills and upon frog and switch works has hardly been appreciated. One large mill in the Central West is booked up to September. The Chicago Railways Company is in the market for 12,000 tons of girder rails, the Duluth & Northern Minnesota has bought 2000 tons and a New Orleans road 1500 tons.

Bar iron, in which the advance has outrun that for steel bars, partly through better deliveries, is easing off and lower prices are reported in Eastern territory.

For the 4500 cars it will build in its own shops the Norfolk & Western has placed 60,000 tons of plates, shapes and bars at Pittsburgh. The Boston & Maine order is expected to be for 6000 cars.

Pittsburgh reports some slight relief of the tightness in semi-finished steel. A large consumer of sheet bars has just placed its contract for the second half on a sliding scale basis.

Pig iron producers are not yet ready to say that the increase in inquiry in the past week is the forerunner of the new buying that has been awaited for two months. Buyers are still cautious, and not less so in view of the lower prices developed by the week's inquiries. In foundry iron further slight concessions from the December level are reported at Buffalo, in Eastern Pennsylvania and in Northern Ohio. Southern resale iron can be had at \$13.25 Birmingham for No. 2 and some Tennessee quotations figure back to \$13 at Birmingham.

An inquiry for 4500 tons of basic iron for a Western Maryland steel plant calls for deliveries in the second half. At Pittsburgh two buyers of basic iron are expected to come into the market in March for the second half. A recent sale at Buffalo involves the delivery of hot metal to a nearby steel works—the entire output of one furnace for about three months.

Old material still tends downward, Pittsburgh alone reporting slight improvement, and that on heavy melting steel. The Chicago market has been unsettled further by the marketing of part of the large Santa Fé accumulation.

Our foreign market letters tell of the arrangement for the rolling of an American steel company's form of sheet piling by a French mill; also that an American steel company has bought the output of a German tool steel plant and will market it here.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month and one year previous.

	Feb. 26, 1913.	Feb. 19, 1913.	Jan. 29, 1913.	Feb. 28, 1912.
Pig Iron, Per Gross Ton:				
Foundry No. 2 X, Philadelphia	\$18.00	\$18.25	\$18.50	\$14.85
Foundry No. 2, Valley furnace	17.00	17.00	17.50	13.00
Foundry No. 2, S'th'n, Cin'ti...	16.50	16.75	16.75	13.50
Foundry No. 2, Birmingham, Ala.	13.25	13.50	13.50	10.25
Foundry No. 2, furnace, Chicago*	17.25	17.25	17.50	14.00
Basic, delivered, eastern Pa...	18.00	18.00	18.00	14.25
Basic, Valley furnace	16.25	16.25	16.35	12.25
Bessemer, Pittsburgh	18.15	18.15	18.15	14.90
Malleable Bessemer, Chicago*	17.25	17.25	17.50	14.00
Gray forge, Pittsburgh	17.15	17.15	17.15	13.40
Lake Superior charcoal, Chicago	18.00	18.00	18.00	15.75
Billets, etc., Per Gross Ton:				
Bessemer billets, Pittsburgh...	28.50	28.50	28.50	20.00
Open hearth billets, Pittsburgh.	29.00	29.00	29.00	20.00
Forging billets, Pittsburgh	36.00	36.00	36.00	26.50
Open hearth billets, Philadelphia	32.00	32.00	32.00	22.40
Wire rods, Pittsburgh	30.00	30.00	30.00	25.00

Old Material, Per Gross Ton:				
Iron rails, Chicago	16.25	16.25	16.75	15.00
Iron rails, Philadelphia	18.00	18.00	18.00	15.50
Car wheels, Chicago	16.75	16.75	16.75	13.00
Car wheels, Philadelphia	15.00	15.00	16.25	12.00
Heavy steel scrap, Pittsburgh...	14.00	14.00	14.75	12.00
Heavy steel scrap, Chicago*	12.60	12.25	12.50	10.50
Heavy steel scrap, Philadelphia	12.50	12.50	14.00	11.75

Finished Iron and Steel,				
Per Pound to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bessemer rails, heavy, at mill...	1.25	1.25	1.25	1.25
Iron bars, Philadelphia	1.67½	1.67½	1.67½	1.25
Iron bars, Pittsburgh	1.70	1.70	1.70	1.25
Iron bars, Chicago	1.57½	1.60	1.57½	1.15
Steel bars, Pittsburgh, future...	1.40	1.40	1.40	1.10
Steel bars, Pittsburgh, prompt...	1.70	1.70	1.70	1.10
Steel bars, New York, future...	1.56	1.56	1.56	1.26
Steel bars, New York, prompt...	1.86	1.86	1.86	1.26
Tank plates, Pittsburgh, future	1.45	1.45	1.50	1.10
Tank plates, Pittsburgh, prompt	1.70	1.70	1.75	1.10
Tank plates, New York, future...	1.61	1.61	1.66	1.26
Tank plates, New York, prompt	1.86	1.86	1.91	1.26
Beams, Pittsburgh, future	1.45	1.45	1.50	1.10
Beams, Pittsburgh, prompt	1.70	1.70	1.75	1.10
Beams, New York, future	1.61	1.61	1.66	1.26
Beams, New York, prompt	1.86	1.86	1.91	1.26
Angles, Pittsburgh, future	1.45	1.45	1.50	1.10
Angles, Pittsburgh, prompt	1.70	1.70	1.75	1.10
Angles, New York, future	1.61	1.61	1.66	1.26
Angles, New York, prompt	1.86	1.86	1.91	1.26
Skelp, grooved steel, Pittsburgh	1.45	1.45	1.45	1.10
Skelp, sheared steel, Pittsburgh	1.50	1.50	1.50	1.15
Steel hoops, Pittsburgh	1.60	1.60	1.60	1.25

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire,

	Feb. 26, 1913.	Feb. 19, 1913.	Jan. 29, 1913.	Feb. 28, 1912.
Per Pound to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, Pittsburgh	2.35	2.35	2.35	1.85
Wire nails, Pittsburgh	1.75	1.75	1.75	1.60
Wire nails, f.o.b. Eastern mills	1.80	1.80	1.80	...
Wire nails, Pittsburgh	1.70	1.70	1.70	1.55
Wire wire, ann'l'd, 0 to 9, Pgh.	1.55	1.55	1.55	1.40
Wire wire, galv., Pittsburgh	2.15	2.15	2.15	1.90

Coke, Connellsville, Per Net Ton, at Oven:

Pomace coke, prompt shipment	\$2.35	\$2.25	\$3.50	\$1.80
Pomace coke, future delivery	2.50	2.50	3.15	1.80
Foundry coke, prompt shipment	3.00	3.00	4.25	2.25
Foundry coke, future delivery	3.00	3.00	3.60	2.25

Metals,

Per Pound to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	15.00	15.00	16.50	14.50
Electrolytic copper, New York	14.75	14.87½	16.30	14.37½
Spelter, St. Louis	6.10	6.20	6.75	6.75
Spelter, New York	6.25	6.35	6.90	6.90
Lead, St. Louis	4.20	4.20	4.20	3.92½
Lead, New York	4.35	4.35	4.35	4.00
Tin, New York	48.50	49.25	50.40	43.37½
Antimony, Hallett, New York	8.62½	8.75	9.25	7.37½
Tin plate, 100-lb. box, Pittsburgh	\$3.60	\$3.60	\$3.60	\$3.30

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 8cc. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 95c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.45c. to 1.75c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers, with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼ in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft., down to the weight of 3-16 in., take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras,

Cents per lb.

Gauges under ¼ in. to and including 3-16 in.	.10
Gauges under 3-16 in. to and including No. 2	.15
Gauges under No. 8 to and including No. 9	.25
Gauges under No. 9 to and including No. 10	.30
Gauges under No. 10 to and including No. 12	.46
Sketches (including straight taper plates) 3 ft. and over	.10
Complete circles, 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Widths over 130 in.	1.00
Cutting to lengths or diameters under 3 ft. to 2 ft., inc.	.25
Cutting to lengths or diameters under 2 ft. to 1 ft., inc.	.50
Cutting to length or diameters under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs. ¼ in. thick and over, and zees, 3 in. and over, 1.45c. to 1.75c. Extras on other shapes and sizes are as follows:

Cents per lb.

I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in. on one or both legs	.10
Angles, 3 in. on one or both legs, less than ¼ in. thick, as per steel bar card, Sept. 1, 1909	.70
Tees, structural sizes (except elevator, hand rail, car-truck and conductor rail)	.05
Angles, channels and tees, under 3 in. wide as per steel bar card, Sept. 1, 1909	.20 to .80
Deck beams and bulb angles	.30
Hand rail tees	.75
Cutting to length, under 3 ft., to 2 ft. inclusive	.25
Cutting to length, under 2 ft., to 1 ft. inclusive	.50
Cutting to length, under 1 ft.	1.55

No charge for cutting to lengths 3 ft. and over.

Wire Rods and Wire.—Bessemer, open hearth and chain rods, \$30. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, \$1.55; galvanized, \$1.95. Galvanized barb wire, to jobbers, \$2.15; painted, \$1.75. Wire nails, to jobbers, \$1.75.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12 & 12½	13	14	15	16
Annealed	\$1.70	\$1.75	\$1.80	\$1.85	\$1.95	\$2.05	\$2.15	\$2.25
Galvanized	2.10	2.15	2.20	2.25	2.35	2.45	2.85	2.95

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe (full weight) in effect from January 1, 1913, iron pipe (full weight), from October 21, 1912:

Butt Weld,

Inches.	Steel.	Black.	Galv.	Inches.	Iron.	Black.	Galv.
1½, 2 and 3	73	52½	54	1½ and 2	67	48	48
3½ to 3	77	66½	68	2½ to 3	66	57	57
	80	71½	72	3½ to 4	70	57	57
				4½ to 5	73	62	62

Lap Weld,

2	77	68½	1½	57	46
2½ to 6	79	70½	1½	68	57
7 to 12	76	65½	2	69	59
13 to 15	53		2½ to 4	71	62
			4½ to 6	71	62
			7 to 12	69	56

Plugged and Reamed,

1 to 3, butt	78	69½	1 to 1½, butt	71	60
2, lap	75	66½	2, butt	72	61
2½ to 4, lap	77	68½	1½, lap	55	44
			1½, lap	66	55
			2, lap	67	57
			2½ to 4, lap	69	60

Butt Weld, extra strong, plain ends,

1½, 2 and 3	68	57½	3½	64	53
3½ to 4	73	66½	4½	68	61
4½ to 6	77	70½	5½ to 6	72	63
7 to 12	78	71½	2 and 2½	73	64

Lap Weld, extra strong, plain ends,

2	74	65½	1½	66	60
2½ to 4	76	67½	2	67	59
4½ to 6	75	66½	2½ to 4	71	62
7 to 8	68	57½	4½ to 6	70	61
9 to 12	63	52½	7 and 8	64	54
			9 to 12	59	48

Butt Weld, double extra strong, plain ends,

1½	63	56½	1½	58	50
3½ to 4	66	59½	3½ to 4	61	53
4½ to 6	68	61½	2 to 2½	63	55

Lap Weld, double extra strong, plain ends,

2	64	57½	2	56	50
2½ to 4	66	59½	2½ to 4	61	55
4½ to 6	65	58½	4½ to 6	60	54
7 to 8	58	47½	7 to 8	53	43

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts to jobbers in carloads on lap welded steel, in effect from February 1, 1913, and standard charcoal iron boiler tubes, in effect from January 1, 1913, are as follows:

Lap Welded Steel,	Standard Charcoal Iron,
1½ and 2 in.	60
2½ in.	57
2½ and 3½ in.	63
3 and 3½ in.	68
3½ to 4½ in.	70
5 and 6 in.	63
7 to 13 in.	60
1½ in.	44
1½ and 2 in.	48
2½ in.	44
2½ and 3½ in.	53
3 and 3½ in.	55
3½ to 4½ in.	58

Locomotive and steamship special grades bring higher prices.

2½ in. and smaller, over 18 ft., 10 per cent. net extra.

2½ in. and larger, over 22 ft., 10 per cent. net extra. Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft. and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Sheets.—Makers' prices for mill shipments on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets,

Cents per lb.

Nos. 3 to 8	1.70
Nos. 9 and 10	1.75
Nos. 11 and 12	1.80
Nos. 13 and 14	1.85
Nos. 15 and 16	1.95

Box Annealed Sheets, Cold Rolled,

Nos. 10 and 11	2.00
No. 12	2.00
Nos. 13 and 14	2.05
Nos. 15 and 16	2.15
Nos. 17 to 21	2.20
Nos. 22 and 24	2.25
Nos. 25 and 26	2.30
No. 27	2.35
No. 28	2.40
No. 29	2.45
No. 30	2.50

Galvanized Sheets of Black Sheet Gauge.

	Cents per lb.
Nos. 10 and 11	2.50
No. 12	2.60
Nos. 13 and 14	2.60
Nos. 15 and 16	2.75
Nos. 17 to 21	2.90
Nos. 22 and 24	3.05
Nos. 25 and 26	3.20
No. 27	3.35
No. 28	3.50
No. 29	3.65
No. 30	3.80

Pittsburgh

PITTSBURGH, PA., February 25, 1913.

The market is in a peculiar condition. Pig iron, coke and scrap are weak and neglected, but steel is strong and specifications for finished iron and steel continue heavy. A good deal of pessimistic talk is heard, but the heads of large steel companies say it is not warranted. The railroads have been heavy buyers of rails and other track materials and rolling stock taking large quantities of steel and the outlook is for full operation of the mills into the summer. At the same time there is more or less uneasiness as to the future. The mills still have a good deal of low-priced business on their books against which buyers are specifying heavily, but it is claimed that when this is cleaned up there will be a material falling off, as consumers will not be so eager to buy at the higher figures. Competition for new business is keen, and on some products, such as pipe, rivets, bolts and structural and fabricated material there has been shading of what are regarded as to-day's prices. The disposition to go slow in the matter of making new engagements is stronger, as buyers can see little incentive at present to make contracts ahead. The announcement of an extra session of Congress on April 1 has increased the fears of many in the trade that business is going to suffer until it is known definitely what will be done with the tariff. Changes in prices in the past week are confined to a slight recovery in coke.

Pig Iron.—While the market is quiet there are signs of a buying movement that is expected to develop early in March. The N. & G. Taylor Company, Cumberland, Md., has an inquiry out for 750 tons of basic iron per month over last half of the year, and two local open-hearth steel companies are expected to come in the market soon in March for their supply of basic iron for second quarter. While the pig-iron market has been dull since late in December, it is pointed out that prices have declined but little, and should a buying movement start it is believed that values would soon reach a higher level. There is no doubt that the low prices ruling on scrap and the heavy decline in coke have caused a weaker tendency in pig iron, but there has not been enough new buying in several months to test the market thoroughly. There is a moderate inquiry for foundry iron and several fair-sized sales of forge have been made in the past week. We quote Bessemer iron for delivery up to July at \$17.25; basic, \$16.25 to \$16.35; malleable Bessemer, \$17 to \$17.25; gray forge, \$16.25 to \$16.50, and No. 2 foundry, \$17 to \$17.25, all at Valley furnace, the freight rate for delivery in the Pittsburgh district being 90c. a ton.

Billets and Sheet Bars.—While the steel situation is still tight, there are signs that the supply is probably a little better. It is evident, however, that there is not steel capacity enough to meet the demand of consumers when they are running their mills full as they have been for months. A leading consumer of sheet bars made a contract last week with a local mill for its supply for last half of the year on a sliding scale basis, a good many thousand tons being involved. Most of the steel that has been offered for sale in the open market is by dealers who ask \$2 to \$3 a ton over prices charged to consumers who have regular contracts with the mills. Reports are that open-hearth sheet bars have sold for reasonably prompt shipment at \$30 to \$31 at maker's mill, but these prices represent the necessity of the buyer. The steel market nominally is as follows: Bessemer billets, \$28.50 to \$29; Bessemer sheet bars, \$29 to \$29.50; open-hearth billets, \$29 to \$29.50, and open-hearth sheet bars, \$29.50 to \$30, f.o.b. mill, Pittsburgh or Youngstown. Forging billets, \$36 to \$37 and axle billets, \$34 to \$35, Pittsburgh.

Ferroalloys.—The new inquiry is quiet and prices on ferromanganese are only fairly strong. Premiums for prompt shipment have entirely disappeared. We note sales of two cars, or about 60 tons, of 80 per cent. for prompt delivery at \$64 seaboard, and quote for prompt and forward delivery at \$64 to \$65, seaboard. Consumers of ferrosilicon are not getting

prompt deliveries, as there is a scarcity in supply. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at \$75; over 100 tons to 600 tons, \$74; over 600 tons, \$73, Pittsburgh. We quote 10 per cent. at \$41; 11 per cent., \$25; 12 per cent., \$26, f.o.b. cars at furnace, Jackson, Ohio, or Ashland, Ky. We quote ferrotitanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over and 12½c. in lots up to 2000 lb.

Wire Rods.—The only inquiry that has come out for some time is for 300 tons of open-hearth rods. Consumers continue to specify freely against their contracts and prices are firm. We quote Bessemer, open-hearth and chain rods at \$30, Pittsburgh.

Muck Bar.—This material is neglected. We continue to quote best grades made from all pig iron, at nominally \$31, Pittsburgh.

Skelp.—The market is quiet, as consumers are covered ahead for sometime. We quote grooved skelp at 1.45c. to 1.50c.; sheared steel skelp, 1.50c. to 1.55c.; grooved iron skelp, 1.75c. to 1.80c.; sheared iron skelp, 1.85c. to 1.90c., delivered at buyers' mills in the Pittsburgh district.

Steel Rails.—No new orders for standard sections have been placed with the local interest. The new demand for light rails is active, the Carnegie Steel Company having received new orders and specifications in the past week for about 3500 tons. We quote splice bars at 1.50c. per lb. and standard section rails at 1.25c. per lb. Light rails are quoted as follows: 25, 30, 35, 40 and 45 lb. sections, 1.25c.; 16 and 20 lb., 1.30c.; 12 and 14 lb., 1.35c., and 8 and 10 lb., 1.40c., all in carload lots, f.o.b. Pittsburgh.

Carwheels.—Some large inquiries are out for steel and cast iron wheels. We quote 33-in. rolled steel wheels for freight service at \$15 to \$15.50 and 36-in. for passenger cars at \$19 to \$19.50 per wheel, f.o.b. Pittsburgh.

Structural Material.—The past week has been quiet as to new lettings but there is a fair amount of inquiry. The Jones & Laughlin Steel Company has taken 1000 tons for an addition to the Jewett Works of the National Lead Company on Staten Island and the McClintic-Marshall Construction Company 500 tons for a new building for the Columbus Bolt & Nut Company, Columbus, Ohio. Bids will go in this week on about 4000 tons for steel buildings for the new plate mills to be built by the Otis Steel Company, Cleveland, Ohio. Plans are being made for the Kaufmann-Baer department store in this city which will take 5000 to 6000 tons. An addition is being made of four more stories to the Stambaugh office building in Youngstown, Ohio, the steel for which, about 400 tons, was contracted for last November. The Pennsylvania Rubber Company will put up a new building at Jeanette, Pa., requiring about 1000 tons, but bids have not been asked. We quote beams and channels up to 15 in. at 1.45c. to 1.50c. for delivery at convenience of the mill, which would be second half of this year, while small lots from warehouse for prompt delivery are bringing from 1.60c. up to 2c., depending on the size of the order and the deliveries wanted.

Plates.—New car orders have been light and it is now stated that the Baltimore & Ohio has decided to defer for the present its proposed large purchase. The Norfolk & Western has bought about 60,000 tons of plates from the Carnegie Steel Company for cars to be built in its own shops and the Carnegie Company has also taken 15,000 tons of plates and shapes, exclusive of the armor plate, for the new battleship Pennsylvania to be built by the Newport News Ship Building & Dry Dock Company. The Boston & Maine is reported in the market for 3500 to 4000 box cars with steel underframes, the Pennsylvania is inquiring for 300 passenger cars, and the Illinois Central for about 30. With business already on their books and in sight the two leading local plate mills have their output pretty well sold up to October, and in fact have very little material to offer on new orders for delivery this year. We quote ¼-in. and heavier tank plate at 1.45c., Pittsburgh, for forward delivery, while for shipment in three to four weeks 1.60c. to 1.65c. is quoted for carload and larger lots, and from 1.75c. to as high as 2c. for small lots, f.o.b. Pittsburgh.

Iron and Steel Bars.—Makers report that the new demand for steel bars continues exceptionally heavy and that specifications against contracts are still in excess of shipments. The Jones & Laughlin Steel Company, which sometime ago announced its intention of selling steel bars for delivery all of this year at 1.40c., has entered a large number of contracts. The steel car companies, who are heavy consumers of bars, report that deliveries from mills are unsatisfactory.

The new demand for iron bars is also heavy and specifications against contracts are coming in freely. All indications are that the iron and steel bar mills will operate to their utmost capacity up to July at least and probably through the whole year. We quote merchant steel bars at 1.40c. to 1.45c. for delivery at convenience of the mill, which would not be before third quarter, while for fairly prompt shipment 1.60c. to 1.85c. is readily paid. We quote iron bars at 1.70c. to 1.75c. for reasonably prompt delivery. Mills charge \$1 extra per ton for twisting 1/4-in. and larger steel bars and \$2 extra for 1/2 to 3/4 in.

Sheets.—While the new demand is not as urgent as it was, this is due to the fact that consumers are bought ahead; they continue to specify heavily against contracts. Most mills have their output sold up to July and some are entering contracts for sheets from their manufacturing customers for third quarter. The American Sheet & Tin Plate Company is operating this week to over 80 per cent. of its sheet mill capacity and would be operating more heavily were it not for the shortage in supply of steel. This company, with practically the same number of hot sheet mills when organized 10 years ago, is turning out about double its former output, and this is largely true of other mills. The outlook for the sheet trade this year is very bright and indications are the mills will run to full capacity the entire year. It is understood the supply of sheet bars, while not yet satisfactory by any means, is showing some improvement. We quote 1.75c. for No. 10 blue annealed; 2.35c. for No. 28 Bessemer black sheets; 3.50c. for No. 28 galvanized, and 2.30c. for No. 28 tin mill black plate. These prices are f.o.b. Pittsburgh, in carload and larger lots, jobbers charging the usual advances for small lots from store.

Tin Plate.—Practically the entire output of tin plate for this year is under contract and a good many makers are complaining of the fact that at \$3.50 and \$3.60 the margin of profit is too small. The American Sheet & Tin Plate Company is operating this week to about 83 per cent. and the other mills are running practically full. We quote 100-lb. cokes at \$3.60, 100-lb. ternes at \$3.45 and No. 28 gauge black plate at \$2.30 f.o.b. Pittsburgh.

Spelter.—The market is weaker. We quote prime grades of Western at 6.10c., East St. Louis, equal to 6.22 1/2c., Pittsburgh.

Railroad Spikes.—Liberal specifications are being received from the railroads and all mills are back in deliveries six to eight weeks or longer. Two of the local makers state they have no spikes to offer on new orders for shipment before July. We quote railroad spikes in base sizes, 5 1/2 x 9/16 in., on large contracts with the railroads, at \$1.80, while for carload lots \$1.90 is charged. Small railroad and boat spikes are strong at \$1.90 to \$2 per 100 lb. f.o.b. Pittsburgh for forward delivery. For prompt delivery small railroad and boat spikes have sold as high as \$2.25 per 100 lb. at mill, being hard to obtain, most makers being back three to four months on their contracts.

Hoops and Bands.—The new demand is only fairly active, most consumers being covered up to July. The mills are back in deliveries from six to eight weeks or longer. We quote steel bands at 1.40c. to 1.45c., with extras as per the steel bar card, and steel hoops at 1.60c. to 1.65c., f.o.b. Pittsburgh, these prices being on orders for shipment at convenience of the mills.

Shafting.—There is a fair amount of new buying, and inquiries in the market from implement makers and other consumers for their supply of shafting for first half of next year. Makers state that consumers are willing to buy for such late delivery on this present market. It is stated that discounts are being firmly held and that there is no incentive to cut prices as all the shafting makers have as much business as they can take care of to the satisfaction of their customers. We quote cold-rolled shafting at 58 per cent. off in carloads and larger lots and 52 per cent. in small lots delivered in base territory.

Merchant Steel.—Consumers generally are covered on their entire wants up to July or longer and there is only a fair amount of new buying. The mills are making slightly better shipments, but are still back in deliveries four to six weeks or longer. We quote: Iron finished tire, 1 1/2 x 3/4 in. and larger, 1.40c. to 1.55c., base; under 1 1/2 x 3/4 in., 1.55c. to 1.65c.; planished tire, 1.60c. to 1.70c.; channel tire, 3/4 to 7/8 and 1 in., 1.90c. to 2c.; 1 1/4 in. and larger, 1.80c. to 1.90c.; toe calk, 2c. to 2.10c., base; flat sleigh shoe, 1.50c. to 1.65c.; concave and convex, 1.80c. to 1.90c.; cutter shoe, tapered or bent, 2.30c. to 2.40c.; spring steel, 2c. to 2.10c.; machinery steel, smooth finish, 1.80c. to 1.85c. We quote cold-

rolled strip steel as follows: Base rates for 1 in. and 1 1/2 in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.30c.; soft, 3.55c.; coils, hard, 3.20c.; soft, 3.45c.; freight allowed. The usual differentials apply for lighter gauges and sizes.

Wire Products.—The spring trade has not yet reached its full swing and new demand is quiet. Specifications this month have not been as active as in January. It is believed that early in March the demand will be heavier. We quote wire nails at \$1.75 per keg; cut nails, \$1.70 per keg; galvanized barb wire, \$2.15 per 100 lb.; painted, \$1.75; annealed fence wire, \$1.55, and galvanized fence wire, \$1.95, f.o.b. Pittsburgh, usual terms, freight added to point of shipment. Jobbers charge the usual advances for small lots from store.

Bolts and Rivets.—Local makers disclaim any knowledge of any cutting in prices of bolts or rivets in this market, such as reported in the East. Makers of bolts and rivets in this district are badly oversold, being back in deliveries six to eight weeks or longer, claiming for this reason that there is no necessity for any cutting in prices. New demand has quieted down somewhat, as consumers are covered to July or longer. We quote button head structural rivets at \$2.20 and cone head boiler rivets at \$2.30 per 100 lb. The discounts on bolts are as follows, in lots of 300 lb. or over, delivered within a 20c. freight radius of maker's works:

Coch and lag screws	.....80 and 10% off
Small carriage bolts, cut threads	.....75 and 5% off
Small carriage bolts, rolled threads	.....75 and 10% off
Large carriage bolts	.....70% off
Small machine bolts, cut threads	.....75 and 10% off
Small machine bolts, rolled threads	.....75, 10 and 5% off
Large machine bolts	.....70 and 7% off
Machine bolts with C.P.C. and T nuts, small	75 and 5% off
Machine bolts with C.P.C. and T nuts, large	.....70% off
Square hot pressed nuts, blanked and tapped	.....\$5.70 off list
Hexagon nuts	.....\$6.30 off list
C.P.C. and R. square nuts, tapped and blank	.....\$5.70 off list
Hexagon nuts 3/4 and larger	.....\$6.60 off list
Hexagon nuts smaller than 3/4	.....\$7.20 off list
C.P. plain square nuts	.....\$5.20 off list
C.P. plain hexagon nuts	.....\$5.50 off list
Semi-finished hexagon nuts 3/4 and larger	.....85% off
Semi-finished hex. nuts smaller than 3/4	.....85 and 10% off
Rivets, 7/16 x 6 1/2, smaller and shorter	.....75, 10 and 10% off
Rivets, metallic tinned, bulk	.....3 1/2c. per lb. net extra
Rivets, tin plated, bulk	.....1 1/2c. per lb. net extra
Rivets, metallic tinned, packages	.....70, 10 and 10% off

Merchant Pipe.—The demand keeps up very well and is reported by the mills to be heavier than usual at this season. The Youngstown Sheet & Tube Company has taken an order for 60 miles of 8-in. pipe for the General Petroleum Company of California. The contract for the Panama-Pacific Exposition low pressure and high pressure lines, involving 1000 to 1200 tons of steel pipe, has been divided between the Crane Company, Chicago, and the Mark-Lalley Company, San Francisco, the latter being the selling agent for the Mark Mfg. Company, Zanesville, Ohio. An inquiry is in the market for 10 miles of 16-in. for shipment to California and the Ohio Fuel Supply Company is inquiring for 15 miles of 12-in. The new demand for casing and other oil well supplies is heavy, largely due to the opening up of new oil fields on account of the high prices ruling for crude oil. It is said that more new drilling is under way at present than ever before in the history of the oil trade. There is some unevenness in discounts on merchant pipe, a few mills shading these from 2 1/2 to 5 per cent., depending on the order.

Boiler Tubes.—Merchant and locomotive tubes are in heavy demand, particularly locomotive tubes, as the locomotive builders have their shops filled up with work for some months ahead. The demand for seamless tubing has been strong for some time and the mills report they are back in deliveries three to four months. An advance in prices of iron boiler tubes is looked for in the near future.

Iron and Steel Scrap.—There is more new inquiry, and some prices, notably on heavy steel scrap, are slightly better. The leading local consumer that has been out of the market for some time has bought several lots of steel scrap, aggregating 3000 to 4000 tons, at \$14.25 to \$14.50, delivered. The market on borings is very strong, and it is said that as high as \$10.50 has been offered by dealers who are short. The opinion is that the scrap market has probably touched bottom. While consumers are not as yet very eager to buy, they are showing more interest. Several leading mills have cleaned up their supply of scrap pretty well, and one large consumer that has not latterly been buying is now taking in a considerable tonnage of borings. The consumption of scrap is very large, and the American Steel Foundries is a new consumer in this district for scrap at its Sharon plant. Some dealers are com-

plaining of rejections of material by the mills that under other conditions would not be made. Ordinary grades of steel scrap can still be had at \$14 to \$14.25, delivered. We note sales of 300 tons of bundled sheet scrap at \$11.75, delivered Monessen, Pa.; 250 tons of heavy cast scrap at \$14.25; about 300 tons of low phosphorus plate ends at \$16.25, and 500 tons of sheet bar crop ends at about \$16.25, delivered. The market on machine shop turnings is especially depressed and consumers have refused to buy at \$9, delivered. We have again revised prices on some grades. Dealers are quoting per gross ton as follows:

Heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen and Pittsburgh delivery	\$14.00 to \$14.25
No. 1 foundry cast	15.00 to 15.25
No. 2 foundry cast	14.00 to 14.25
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	11.75 to 12.00
Revolving rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	16.25 to 16.50
No. 1 railroad malleable stock	14.25 to 14.50
Grate bars	10.75 to 11.00
Low phosphorus melting stock	17.50 to 18.00
Iron car axles	24.25 to 24.75
Steel car axles	17.75 to 18.00
Locomotive axles, steel	21.75 to 22.00
Locomotive axles, iron	27.75 to 28.00
No. 1 busheling scrap	14.25 to 14.50
No. 2 busheling scrap	10.25 to 10.50
Old carwheels	15.75 to 16.00
*Cast-iron borings	10.25 to 10.00
*Machine shop turnings	9.00 to 9.25
*Steel car crop ends	16.00 to 16.25
Old iron rails	16.25 to 16.50
No. 1 railroad wrought scrap	16.00 to 16.25
Heavy steel axle turnings	12.50 to 12.75
Stove plate	10.25 to 10.50

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.
 †Shipping point.

Coke.—The tone of the market is stronger. While the asking price of standard grades of furnace coke is \$2.50, so far no sales have been made at this price. A Valley consumer rejected last week a lot of inferior coke and bought about 60 to 70 cars at \$2.30 to \$2.35, delivered. Several large consumers that had suspended shipments are again taking in coke and this has helped the market. The tracks in the coke regions have been pretty well cleared up, and there is not as much coke pressing the market for sale. There is no present inquiry for contract coke, consumers that are not covered having decided to buy from month to month. There is a fair inquiry for foundry coke for spot shipment. We quote standard makes of furnace coke for spot shipment at \$2.35 to \$2.40 and on contracts at about \$2.50 per net ton at oven. There is some inquiry for furnace coke for last-half delivery, but it is very early yet and this is believed to be only for the purpose of sounding the market. We quote standard makes of 72-hr. foundry for prompt delivery at \$3 to \$3.25, with some grades selling at \$2.75 and lower per net ton at oven. The output of coke last week in the Upper and Lower Connellsville regions broke all records, the Connellsville Courier giving the production at 433,441 tons, an increase over the previous week of 22,998 tons.

Chicago

CHICAGO, ILL., February 26, 1913.—(By Telegraph.)

The branches of the general market which have been unsatisfactory to the producer, namely, pig iron and scrap, continue unimproved. From the South offers of Tennessee iron have been made as low as \$13, Birmingham basis, while \$13.50 is the ruling quotation for such Birmingham irons as are being sold. The price of No. 2 Northern foundry at local furnaces is officially \$17.50, with concessions not entirely lacking. Old material prices are generally 25c. a ton lower than a week ago, with less favorable conditions obtaining. In finished steel products there have developed no evidences of retarded business other than those for which congested mill conditions are responsible. Rather is the Western market on the eve of another buying movement during which the implement interests will provide for their annual requirements of bars and structural shapes. The tonnage of specifications and sales for the week under review was somewhat smaller, a circumstance incidental to the short holiday week. The railroads continue to be very active factors, negotiations for rail track fastenings and cars being noteworthy both as to purchases reported and prospective. Inquiries and sales of girder rails aggregate a good quantity, including one lot of 12,000 tons. Current demand for bar iron has slackened somewhat, but prices are firm. Warehouse activity continues at a maximum gait in all lines.

Pig Iron.—The general lack of substantial inquiries and the manifest ability of melters to postpone contracting for forward delivery continue to undermine the position of pig-iron producers, and greater weakness is averted only because of current heavy shipments on past contracts and heavy melting of iron. A few inquiries for iron to be delivered in the second half in lots of 1000 tons and less are reported, but buyers for the most part are piecing out immediate needs in anticipation of prices more favorable for contracting. While local iron is held at \$17.50 at the furnace, a contract price of \$17.25 for second-half iron has been made. Special irons are being sold in small lots, the prices varying through considerable range, depending upon the analysis, and at concessions from the prices of the corresponding standard grades. A sale of 2300 tons of malleable to an Illinois foundry made by a southern Ohio furnace indicates a competitive situation which can only result in lower prices while orders are scarce. Inquiry for Southern iron is especially light and the movement of spot iron, which is being sold on the basis of \$13.50 for Birmingham iron, is practically the only activity. Offers of Tennessee iron at prices equivalent to \$13 at Birmingham are noted. The following quotations are for iron delivered at consumers' yards except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal, Nos. 1, 2, 3, 4....	\$18.00 to \$18.75
Northern coke foundry, No. 1.....	17.75 to 18.25
Northern coke foundry, No. 2.....	17.25 to 18.00
Northern coke foundry, No. 3.....	16.75 to 17.25
Southern coke, No. 1 foundry and No. 1 soft	18.35 to 18.85
Southern coke, No. 2 foundry and No. 2 soft	17.85 to 18.35
Southern coke, No. 3	17.35 to 17.85
Southern coke, No. 4	16.85 to 17.35
Southern gray forge	16.85 to 17.35
Southern mottled	16.35
Malleable Bessemer	17.25 to 17.75
Standard Bessemer	19.40 to 19.90
Basic	17.25 to 17.75
Jackson Co. and Kentucky silvery, 6 per cent.....	20.40
Jackson Co. and Kentucky silvery, 8 per cent.....	21.40
Jackson Co. and Kentucky silvery, 10 per cent.....	22.40

(By Mail)

Rails and Track Supplies.—Railroad buying of track fastenings continues to be an important item, purchases of the past week including an order for rail joints from the Chicago, Milwaukee & St. Paul and 15,000 kegs of spikes from the Great Northern. It is also reported that a round tonnage of standard rails is under consideration. The Chicago Railways Company is in the market for 12,000 tons of girder rails. The Duluth & Northern Minnesota has purchased 2000 tons from the Lorain Steel Company and a New Orleans road 1500 tons. We quote standard railroad spikes at 1.95c. to 2.05c., base; track bolts with square nuts, 2.30c. to 2.40c., base, all in carload lots, Chicago; tie plates, \$33 to \$35 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open-hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—Local fabricators are, with few exceptions, in a position to handle more work than is offering and prices named for contracts show the influence of slightly keener competition. Architectural projects pending are few. Contracts placed the past week aggregated about 3500 tons and include 246 tons taken by the American Bridge Company for a new shaft at the Oliver Iron Mining Company's East Norrie mine; 190 tons for the Soo Line, and 104 tons for the Great Northern. The Milwaukee Bridge Company will furnish 1200 tons for the Chicago, Milwaukee & St. Paul and 896 tons for the Soo Line. The contract for 915 tons for an office building at Houston, Texas, was let by F. H. Kress. We quote for plain structural shapes, Chicago delivery, mill shipment, 1.63c.

Store trade in structural material continues at a record breaking rate and we quote for base sizes out of jobbers' stock 2.05c.

Plates.—The demand for new cars has not yet been exhausted and a number of inquiries are pending of which the more important are the Illinois Central for over 2000 and the Chicago, Rock Island & Pacific for about half that number. The general situation as to deliveries and price is unchanged, prompt shipments from Eastern mills being obtainable only at premiums of \$3 and \$4 a ton. The nominal price for Chicago delivery, mill shipment, continues to be 1.63c.

The price of plate out of store remain, at the exceptionally favorable quotation of 2.05c. Chicago.

Sheets.—The situation has changed but little in several weeks with a good volume of business offering. The position of the larger mills is very firm and prices on the standard sizes are well maintained, concessions

ing mainly on the smaller and special sizes. We quote for Chicago delivery in carloads from mill: No. 28 black sheets, 2.53c.; No. 28 galvanized, 3.68c.; No. 10 black annealed, 1.93c.

at of store prices continue without change as follows: No. 10 black annealed, 2.25c.; No. 28 black, 2.90c.; No. 28 galvanized, 4.15c.

Bars.—Several inquiries for substantial tonnages of steel bars are noted and appearances indicate that the contracting for their annual requirements by the implement manufacturers will materialize much earlier than usual, probably in April. The price at which these contracts will be made is a matter of conjecture, with the chances favoring some figure not necessarily based on current market conditions. The bar-iron situation remains firm on the basis of 1.57½c. to 1.62½c., but specifications are somewhat lighter than they have been. We quote for mill shipment as follows: Bar iron, 1.57½c. to 1.62½c.; soft steel bars, 1.58c. to 1.65c.; hard steel bars, 1.60c. to 1.70c.; shafting in carloads, 58 per cent. off; less than carloads, 53 per cent. off.

For delivery from store, we quote soft steel bars, 1.95c.; bar iron, 1.95c.; reinforcing bars, 1.95c. base with 5c. extra for twisting in sizes ¾ in. and over, and 7½c. extra for smaller sizes; shafting 51 per cent. off.

Rivets and Bolts.—There is no apparent letup in the pressure under which bolt makers are endeavoring to meet the requirements of the contracts on their books. Quotations on new business for early delivery are therefore exceedingly firm while on contract business prices are well maintained. The demand for rivets is routine and normal. Resale transactions, however, give the market some appearances of irregularity. We quote from mill as follows: Carriage bolts up to ¾ x 6 in., rolled thread, 75-10; cut thread, 75-5; larger sizes, 70-2½; machine bolts up to ¾ x 4 in., rolled thread, 70-10-5; cut thread, 75-10; large size, 70-7½; coach screws, 80-10; hot pressed nuts, square head, \$5.70 off per cwt.; hexagon, \$6.30 off per cwt. Structural rivets, ¾ to 1½ in., 2.38c., base, Chicago, in carload lots; boiler rivets, 0.10c. additional.

Out of store we quote for structural rivets, 2.70c., and for boiler rivets, 2.90c. Machine bolts up to ¾ x 4 in., 70-7½; larger sizes, 65-5, carriage bolts up to ¾ x 6 in., 70-5; larger sizes, 65 off. Hot pressed nuts, square head, \$5.30, and hexagon, \$5.90 off per cwt.

Old Material.—The developments of the past few days have contributed still further weakness to the scrap market. The quiet and tentative offering of many thousand tons of its scrap by a railroad which is known to have a large accumulation has added no small degree of uncertainty to the already unsettled condition. The probability of a renewed embargo affecting the yards of one of the largest consumers also exerted a discouraging influence. Trading is very light. The railroad offerings include 1700 tons by the Chicago, Milwaukee & St. Paul, including 500 tons of steel rails, and 2400 tons by the Chicago, Burlington & Quincy. Car wheel prices are nominal in the absence of transactions. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton.	
Old iron rails	\$16.25 to \$16.75
Old steel rails, rerolling	15.50 to 16.00
Old steel rails, less than 3 ft.	14.00 to 14.50
Relaying rails, standard section, subject to inspection	24.00
Old car wheels	16.75 to 17.25
Heavy melting steel scrap	12.00 to 12.50
Frogs, switches and guards, cut apart	12.00 to 12.50
Shoveling steel	11.75 to 12.25
Steel axle turnings	10.50 to 11.00

Per Net Ton.	
Iron angles and splice bars	\$15.50 to \$16.00
Iron arch bars and transoms	16.00 to 16.50
Steel angle bars	12.00 to 12.50
Iron car axles	21.00 to 21.50
Steel car axles	18.50 to 19.00
No. 1 railroad wrought	12.00 to 12.50
No. 2 railroad wrought	11.25 to 11.75
Cut forge	11.25 to 11.75
Steel knuckles and couplers	12.25 to 12.75
Steel springs	12.75 to 13.25
Locomotive tires, smooth	13.50 to 13.75
Machine shop turnings	7.50 to 8.00
Cast and mixed borings	6.50 to 7.00
No. 1 busheling	10.25 to 10.75
No. 2 busheling	7.50 to 8.00
No. 1 boilers, cut to sheets and rings	8.75 to 9.25
Boiler punchings	12.50 to 13.00
No. 1 cast scrap	12.50 to 13.00
Stove plate and light cast scrap	10.25 to 10.75
Railroad malleable	13.00 to 13.50
Agricultural malleable	11.50 to 12.00
Pipes and flues	8.75 to 9.25

Wire Products.—Inquiry for wire nails is very good and shipments are somewhat heavier, although the fact that jobbers have maintained large stocks

throughout the winter months makes the development of the spring movement somewhat slow. Shipments of plain wire to manufacturers continue heavy but it is still somewhat early for a large volume of trading in fence wire which goes for the most part direct to the retailer. Some of the jobbers are replenishing their stocks but greater activity is involved at present in shipments from warehouse to retailer. We quote as follows: Plain wire, No. 9 and coarser, base, \$1.73; wire nails, \$1.93; painted barb wire, \$1.93; galvanized, \$2.33; polished staples, \$1.93; galvanized, \$2.33, all Chicago.

Cast Iron Pipe.—The demand for municipal use is noticeably backward in this territory but a number of large projects are under way in Canada, including 4000 tons for Edmonton and similar quantities for Winnipeg, Ottawa and Hamilton. At Grand Rapids, Mich., a contract was let for 1000 tons and at Minneapolis the letting of 1200 tons is scheduled for March 3. We quote as follows per net ton, Chicago: Water pipe, 4 in., \$31; 6 to 12 in., \$29; 16 in. and up, \$28, with \$1 extra for gas pipe.

Philadelphia

PHILADELPHIA, PA., February 25, 1913.

Consumers of pig iron are showing a trifle more interest in the situation and it is believed that more active buying will develop in the near future. In some classes of rolled products slightly better deliveries can be had; universal plates are more freely available, as also are iron bars. Billets and sheets continue in good demand, with considerable inquiry originating in the West. In addition to the four vessels on which Eastern shipyards have been figuring, an inquiry for tentative quotations for materials for two more large boats is noted. Car and locomotive inquiries from Eastern railroads continue to develop. The old material situation is unchanged, both buyers and sellers awaiting developments.

Iron Ore.—The market is practically at a standstill. Very little ore, either foreign or domestic, is being offered and few inquiries come from consumers. No sales of importance have been made. Importations during the week include 30,350 tons from Cuba, 5794 tons from Spain and 9049 tons from Sweden.

Pig Iron.—More aggressive buying is believed to be not far distant. Consumers, while not coming into the market with inquiries for any large tonnages, are quietly giving the situation more attention. Consumption goes ahead at a rapid pace, and few melters are believed to have accumulated any material quantity of iron in their yards. No increase in the productive rate of pig iron has been made in the East and stocks have been steadily decreasing. Under the circumstances a number of producers are inclined to hold to recent quotations more firmly, although there are some, who, more anxious for orders, have made concessions. In the foundry grades a shade more inquiry has developed. Sales have been principally in lots ranging up to 100 tons and while some makers of standard brands of eastern Pennsylvania No. 2 X foundry still hold at \$18.25 to \$18.50, delivered, others have been shading the inside quotation and \$18 flat could readily be done on fair-sized business. Cast iron pipe makers are quietly looking around for moderate lots of low grade iron and would buy heavily at their prices. The appearance of low price resale Southern and Virginia iron has had some bearing on consumers' ideas of prices, but Eastern makers are not meeting those low quotations. A somewhat better movement in Virginia foundry iron has developed; sales of small lots last week were more numerous, particularly for early shipment, at \$15.50 at furnace. The League Island Navy Yard, which recently placed an order for a small lot of pig iron, is inquiring for 200 to 300 tons of No. 2 X foundry for March shipment. A large maker of malleable castings, recently in the market for 1000 tons of coke malleable pig, has closed for a part of this, taking 400 tons of Western iron at \$17. Valley. Odd lots of rolling mill forge, have been sold at irregular prices, although \$17 to \$17.25, delivered, about represents the market for standard brands. Steel making irons show little activity. A Cumberland steel maker, with headquarters in this city, has an inquiry out for 4500 tons of basic for last half. This business usually goes to Western furnaces. Eastern steel mills are not openly inquiring for basic. Small sales of standard analysis low phosphorus pig have been made at \$24.50, delivered here, for reasonably early shipment. Prices of pig iron show little change. In some grades they are easier, but as a rule represent the market nom-

inally. For delivery in buyers' yards in this district the following range is quoted:

Eastern Pennsylvania No. 2 X foundry.....	\$18.00 to \$18.50
Eastern Pennsylvania No. 2 plain.....	17.75 to 18.00
Virginia No. 2 X.....	18.30 to 18.50
Virginia No. 2 plain.....	18.05 to 18.75
Gray forge.....	17.00 to 17.25
Basic, nominal.....	18.00
Standard low phosphorus.....	24.50

Ferroalloys.—No demand is reported for 80 per cent. ferromanganese. For second half delivery sellers hold at \$65, seaboard, but good supplies have weakened the prompt market, it being reported that \$64 could be done for early delivery. Importations of ferromanganese at this port last week aggregated 1353 tons. Ferrosilicon is quiet; miscellaneous lots of 50 per cent. are being inquired for, but little business is passing in that or furnace grades.

Billets.—In addition to a good week-to-week demand, Eastern mills continue to receive inquiries for round lots from Western consumers, who are short of steel and would place orders for lots running up to 2000 tons for prompt delivery, for which premiums would be paid. Producers, however, are well sold up and are not taking on business of any size from new customers. Some makers have opened order books for the third quarter to regular customers, extending tonnage and delivery over that quarter at second quarter prices, usually slightly under the current market. For general business the recent quotation of \$32, delivered, for basic open-hearth rolling billets is maintained, while ordinary forging billets are held at \$36, mill minimum.

Plates.—While specifications have been a shade less plentiful, mills continue to receive a very satisfactory volume of new business. Deliveries on universal plates are a trifle easier, but an increased demand for sheared plates evens up tonnage. Specifications for car plates have been heavy. Eastern mills still withhold opening of order books for third quarter, although considerable inquiry is pending. Tentative inquiries for plates for two new boats, for estimating purposes have been received by Eastern mills. Prices are firmly maintained by producers in this district at 1.75c. for sheared and 1.80c. for universal plates, delivered here, although Western plates, for extended uncertain delivery are still available at 1.65c. delivered.

Structural Material.—A steady volume of business has been coming to makers of plain shapes and the aggregate tonnage for February, at some mills will show an increase over January. Fabricators are figuring on a large amount of work. The city of Philadelphia will let contracts for several steel plate girder bridges, involving considerable tonnage. The recent inquiry for bridges by the Norfolk & Western Railroad has been closed. The contract for 2700 tons of material for the Penn Mutual Life Building has been definitely placed with the leading interest. The Phoenix Bridge Company has a contract for a double track plate girder bridge, over Stony Creek, for the Philadelphia & Reading Railroad. Large contracts in connection with building work are in sight and the trade feels decidedly optimistic regarding the situation. Eastern mill prices for plain material are firm at 1.75c. delivered for contract and 1.85c. to 1.90c. for prompt mill shipments.

Sheets.—Mills are booking good orders for near future delivery. A fair tonnage for third quarter has also been entered and considerable inquiry for third quarter and last half shipment is out. As a rule, producers in the East are not entering orders for heavy extended delivery, but more business of that character is on their books than ever before at this season. Quotations are very firm. Eastern mills making smooth, loose-rolled sheets, quote 2.05c. for No. 10 blue annealed, while Western sheets, on which delivery is uncertain, are quoted at 1.90c. delivered here.

Bars.—The iron bar market has a somewhat easier appearance. Orders are less plentiful and more mills are gradually getting to the point where additional orders are desirable. Many mills, however, are still pretty well covered for the near future. Ordinary iron bars are more generally obtainable at 1.60c. mill, or 1.67½c. delivered here, although concessions on particularly desirable business are heard of. A moderate volume is moving in steel bars, at unchanged prices, namely, 1.55c. to 1.60c. for contract and 1.85c. delivered here for prompt shipment.

Coke.—The supply of prompt furnace coke is not so heavy, neither has the demand been active. A wide range of prices is quoted for foundry coke, which has been in irregular demand. Some brands command \$4 at oven, while good grades may be had at \$3 to \$3.25 with fair grades even lower. The following range

of prices, per net ton, is named for deliveries in buyers' yards in this district:

Connellsville furnace coke.....	\$4.70 to \$5.20
Connellsville foundry coke.....	5.25 to 5.75
Mountain furnace coke.....	4.35 to 4.85
Mountain foundry coke.....	5.00 to 5.50

Old Materials.—Dullness characterizes the market. Buyers continue to show little interest in the situation, being well covered for early requirements and take on small lots of material only at bargain prices, although it is evident that business of this character is growing quieter. Melters are taking deliveries freely against contracts. There has been practically no movement in heavy melting steel. Rolling mill grades are easier. More weakness has been shown in turnings than in borings. The waiting tendency continues strongly apparent in all grades. Quotations are nominal; in the majority of grades not enough business is moving to establish quotations. The following range about represents the market for small lots, delivered in buyers' yards in this district, covering eastern Pennsylvania and nearby points, taking a freight rate varying from 35c. to \$1.35 per gross ton:

No. 1 heavy melting steel.....	\$12.50 to \$13.00
Old steel rails, rerolling (nominal).....	15.50 to 16.00
Low phosphorus heavy melting steel scrap.....	17.75 to 18.25
Old steel axles (nominal).....	19.00 to 20.00
Old iron axles (nominal).....	27.00 to 28.00
Old iron rails.....	18.00 to 18.50
Old carwheels.....	15.00 to 15.50
No. 1 railroad wrought (nominal).....	15.00 to 15.50
Wrought-iron pipe.....	12.50 to 13.00
No. 1 forge fire.....	12.00 to 12.50
No. 2 light iron (nominal).....	7.00 to 7.50
No. 2 cut busheling.....	10.00 to 10.50
Wrought turnings.....	10.00 to 10.50
Cast borings.....	10.00 to 10.50
Machinery cast.....	14.00 to 14.50
Grate bars, railroad.....	10.50 to 11.00
Stove plate.....	10.50 to 11.00
Railroad malleable (nominal).....	13.50 to 14.00

Birmingham

BIRMINGHAM, ALA., February 24, 1913.

Steel mills are operating on double turn in Ensley and Bessemer and on full time at Gadsden. The Tennessee Company made a record of 60,000 tons of rolled steel in the blooming mill at Ensley in January, with an ingot output of 68,350 tons from an average of 6½ furnaces working six days in the week. The surplus steel is being moved to Steel Corporation mills in the North, it is reported. The company is effecting the greatest ore output in its history and has more men employed in the Red Mountain ore mines. The company, as a general proposition, may be said to be working on a 100 per cent. basis.

Pig Iron.—Consumers are feeling the market with more apparent interest than in some time, but trading is still of small volume. Concessions to \$13.25 on resale iron have failed to bring business, offers of a considerable tonnage at that figure having been made recently and turned down by the recipients. Sales during the week have consisted largely of carload lots which have brought from \$13.50 to \$14. The furnace companies, with one exception, continue to quote \$14 as a minimum and assert that they are not selling under that figure. February has been a lean month and accumulations, which showed an increase on January 1, will probably show a still further increase. Some export iron has moved to Italy, Austria and Hull, England, where the American Radiator Company has a plant. Pig-iron quotations are as follows f.o.b. furnaces:

No. 1 soft and foundry.....	\$14.00 to \$14.50
No. 2 soft and foundry.....	13.25 to 14.00
No. 3 foundry.....	13.00 to 13.50
No. 4 foundry.....	12.50 to 13.00
Gray forge.....	12.75 to 13.25
Basic.....	14.00 to 14.50
Charcoal.....	25.00 to 25.50

Cast-Iron Pipe.—Water pipe foundries are in receipt of a sizable volume of small orders, but no large requirements have been let in the Southern field in some time. Plants in Bessemer, Birmingham, Anniston and Chattanooga are at work, but the Sheffield plant is down. Prices might be shaded in the light of the iron market, but for the present quotations are continued at \$24.50 for 4 in. and \$22.50 for 6 in. and upward, with \$1 added for gas pipe.

Coal and Coke.—Mines are turning out a maximum output, but milder weather has a tendency to restrict stock accumulations. Coke is a trifle easier in supply, but prices are firm as ever at \$3.75 to \$4 and even \$4.25 per net ton at oven. Texas and Louisiana are bidding for coke, but satisfactory arrangements have not been

male, owing to high prices and the strong home demand.

Old Material.—Trade is now experiencing a quiet period, with dealers not caring to add extensively to stocks. Relaying rails are somewhat weaker, owing to late offerings by the railroads. Quotations f.o.b. cars at dealers' yards are as follows, per gross ton:

Old iron axles	\$15.50 to \$16.00
Old steel axles	15.50 to 16.00
Old iron rails	15.50 to 16.00
No. 1 railroad wrought	13.00 to 13.50
No. 2 railroad wrought	11.00 to 11.50
No. 1 country wrought	9.50 to 10.00
No. 2 country wrought	9.00 to 9.50
No. 1 machinery cast	10.50 to 11.00
No. 1 heavy melting steel	11.00 to 11.50
Tram carwheels	11.00 to 11.50
Standard carwheels	12.50 to 13.00
Light cast and stove plate	9.50 to 10.00

Cleveland

CLEVELAND, OHIO, February 25, 1913.

Iron Ore.—The railroads are apparently determined to attempt to collect dock charges on ore shipped to Escanaba and Ashland. The new tariffs recently issued included a dock charge of 5 cents a ton for ore shipped to those ports and an additional charge of 1 cent a ton for each day ore is left on the docks after the first ten days. Recently an unofficial announcement was sent out that the railroads had decided to withdraw these charges but no confirmation of this report has come from the railroads themselves and the only official advices that the ore men have are contained in the tariffs that include the extra charge. The shippers do not think that this additional charge is fair, but apparently have not decided what action, if any, they will take in opposition to it. The matter may eventually be taken before the State railroad commissions and the Interstate Commerce Commission. There is no activity in the ore market. We quote prices as follows: Old range Bessemer, \$4.40; Mesaba Bessemer, \$4.15; Old range non-Bessemer, \$3.60; Mesaba non-Bessemer, \$3.40.

Pig Iron.—The market shows more life than for several weeks. While not a great deal of buying is reported, there is considerable inquiry in the way of market feelers for prices on foundry grades for the last-half shipment. One local interest reports the sale of three 1000-ton lots, two for the third quarter and one for the second quarter. A few small lot sales have also been made for early delivery. The price situation is unchanged. In the Valleys sales are being made at \$17 for No. 2 foundry for early or last-half delivery and local furnaces are quoting the same price up to July, although one seller is asking a slightly higher price for Cleveland delivery. In the aggregate only a small tonnage has been sold as yet for delivery after July 1. Ohio silvery iron for early shipment is scarce owing to the fact that three furnaces are out of blast. Southern iron is generally quoted at \$13.50, Birmingham, though lower prices are reported. For prompt shipment and for the first half we quote, delivered Cleveland, as follows:

Bessemer	\$18.15
Basic	\$17.00 to 17.25
Northern No. 2 foundry	17.25 to 17.50
Southern No. 2 foundry	17.85
Gray forge	17.00 to 17.25
Jackson County silvery, 8 per cent. silicon	20.55 to 21.55

Coke.—The price situation is unsettled and there is considerable difference in reports regarding prices. Furnace coke is generally quoted at \$2.40 to \$2.50 per net ton at oven for prompt shipment and \$2.50 to \$2.75 for contract. For standard brands of 72-hr. Connellsville foundry coke \$3.50 appears fairly to represent the market. However, some grades are offered at considerably lower prices and some producers are asking higher prices. The market is dull, the only demand being for small lots of foundry coke for prompt shipment.

Finished Iron and Steel.—The situation regarding deliveries has not eased up any. Consumers continue to crowd the mills for shipments and are being put to much inconvenience because they could not get steel as needed. In the past week or two a number of agricultural implement makers have been seriously affected by their inability to secure steel bar products. They had specified for large tonnages but needed more. They are also handicapped by their inability to secure malleable castings, not yet having had shipments on some specifications sent to the foundries several months ago. While there is considerable demand for small lots of structural material for early delivery, which are being obtained from eastern mills from 1.65c. to 1.75c. at mill, structural specifications are not heavy. During

the past two or three months fabricators have sent in heavy specifications and now have very large stocks on hand. Considerable new structural work is being figured on. Among the structural contracts placed during the week were the following: 400 tons for a factory building for the Willys-Overland Company, Toledo, to the Donovan Iron & Wire Company, Toledo; 100 tons for a building for the German-American Sugar Company, Bay City, Michigan, to the Mt. Vernon Bridge Company, Mt. Vernon, Ohio; 400 tons for rebuilding a bridge in Toledo to the Toledo Bridge & Crane Company. The Lake Erie & Youngstown Railroad, which will build a railroad between Conneaut and Youngstown, Ohio, 65 miles, will require a round tonnage for bridges. This road will also buy about 6500 tons of rails. Several other rail inquiries are pending from the traction roads and one from an industrial company, aggregating about 2200 tons. With the approach of spring the demand for re-inforcing bars has become fairly active. Bar iron is very firm at 1.65c., Cleveland. Warehouse business continues good. Jobbers' prices are unchanged at 2.10c. for steel bars to 2.25c. for plates and structural material.

Old Material.—The demand is still very light. Prices continue weak and quotations on several grades are lower. Consumers have sufficient material on hand to last them for some time and are taking no interest in the market, about the only sales being of odd lots that are being offered at attractive prices. Since mills are well supplied and there is a large amount of scrap available, dealers do not look for much improvement in the demand or strengthening of prices for some time. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton.	
Old steel rails, rerolling	\$14.50 to \$15.00
Old iron rails	16.00 to 16.50
Steel car axles	18.75 to 19.25
Heavy melting steel	12.75 to 13.00
Old car wheels	15.00 to 15.50
Relaying rails, 50 lb. and over	23.00 to 25.00
Agricultural malleable	12.00 to 12.50
Railroad malleable	13.50 to 14.00
Light bundled sheet scrap	12.00 to 12.50
Per Net Ton.	
Iron car axles	\$21.00 to \$21.50
Cast borings	6.50 to 7.00
Iron and steel turnings and drillings	6.50 to 7.00
Steel axle turnings	9.00 to 9.25
No. 1 busheling	11.50 to 12.00
No. 1 railroad wrought	13.50 to 14.00
No. 1 cast	12.50 to 13.00
Stove plate	10.00 to 10.50
Bundled tin scrap	11.00 to 11.50

Cincinnati

CINCINNATI, OHIO, February 24, 1913.

Pig Iron.—The market is a trifle weaker, especially in the South. While a great deal of iron is yet to be bought for last half shipment, and some for filling in purposes for delivery during the remainder of the first half, consumers are holding off and the market is therefore deadlocked, with no immediate prospects of improvement. Although the majority of makers realize that any reduction in prices would not bring out much business, a few of them have met quotations on resale iron and both Northern and Southern figures are about 25c. a ton lower. This practically applies only to the No. 2 foundry grades, as the lower grades in both districts are scarce. There are yet several standard brands of Southern iron held firmly at \$13.50, Birmingham, for spot shipment, with a few small sales booked at this figure. For forward delivery \$13.50 to \$14 is quoted. Melters of basic are expected to come into the market before the foundry iron users, consequently basic prices are firmer than those on Northern foundry grades. Malleable is a little more active, but the largest live inquiry out is for 2000 tons from an Indiana firm. A local foundry is asking for 1300 tons of mixed Northern and Southern iron for last half shipment. The Ohio silvery irons are very firm, and, so far as is known, our present minimum quotation of \$19.50, Iron-ton basis, cannot be shaded, but only a few small lots have changed hands lately. Based on freight rates of \$3.25 from Birmingham and \$1.20 from Iron-ton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 foundry and 1 soft	\$17.00 to \$17.50
Southern coke, No. 2 foundry and 2 soft	16.50 to 17.00
Southern coke, No. 3 foundry	16.50 to 17.00
Southern, No. 4 foundry	16.25 to 16.75
Southern gray forge	16.00 to 16.50
Old silvery, 8 per cent. silicon	20.70 to 21.20
Southern Ohio coke, No. 1	18.20 to 18.70
Southern Ohio coke, No. 2	17.70 to 18.20
Southern Ohio coke, No. 3	17.45 to 17.70
Southern Ohio malleable Bessemer	17.70 to 18.20
Basic, Northern	18.20 to 18.70
Lake Superior charcoal	19.25 to 19.75
Standard Southern carwheel	27.25 to 27.75

Coke.—Connellsville furnace coke averages about \$2.50 per net ton at oven, for either prompt or contract delivery, but on quite a number of brands this price can be shaded 10c. or 15c. Standard foundry grades would average about \$3 per net ton at oven, with the possibility of a 25c. reduction on small lots of coke loaded on cars and that have to be moved promptly. Several operators are holding out for \$3.25 on future shipment 72-hr. coke, but this price is only obtainable now on choice brands. As the demand for coal is falling off, Wise County and Pocahontas quotations are now about on a par with Connellsville prices. A slightly better demand for prompt foundry coke is reported from Wise County.

Finished Material.—There does not seem to be any abatement in the demand for practically all kinds of finished material, as far as this territory is concerned. A number of structural material prospects are expected to develop near here by the time spring opens. There is an excellent call for sheets, as well as for steel bars, and the mills are behind on orders fully as much as they were at the beginning of the year. We quote 1.40c., Pittsburgh basis, on steel bars and from 1.45c. to 1.50c. on structural shapes. Warehouse quotations range from 2c. to 2.05c. on steel bars and around 2.10c. to 2.15c. on structural material.

Old Material.—There has been a reduction in all quotations of about 25c. a ton, and on a few grades this hardly covers the decline. Offerings continue heavy, and while the rolling mills are large consumers many of them had bought some time ago. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b. yards:

Per Gross Ton.	
Bundled sheet scrap	\$10.25 to \$10.75
Old iron rails	13.75 to 14.25
Relaying rails, 50 lb. and up.	21.00 to 21.50
Rerolling steel rails	12.75 to 13.25
Melting steel rails	10.75 to 11.25
Old carwheels	12.50 to 13.00

Per Net Ton.	
No. 1 railroad wrought	\$10.75 to \$11.25
Cast borings	6.75 to 7.25
Steel turnings	7.25 to 7.75
No. 1 cast scrap	10.50 to 11.00
Burnt scrap	7.50 to 8.00
Old iron axles	18.00 to 18.50
Locomotive tires (smooth inside)	11.75 to 12.25
Pipes and flues	7.25 to 7.75
Malleable and steel scrap	9.00 to 9.50
Railroad tank and sheet scrap	6.00 to 6.50

St. Louis

ST. LOUIS, Mo., February 24, 1913.

The iron and steel business continues quiet so far as large items of new business are concerned, but the aggregate movement on contract continues large.

Pig Iron.—Demand continues in small lots running to 50-ton or carload orders needed to fill in or for special requirements. Consumers seem to be contracted up to their requirements for a considerable period, judging from their attitude. The largest sale of the week was for 300 tons and there was also one for 250 tons. Quotations are nominally \$13.50 for No. 2 Southern foundry, Birmingham basis, but resale iron is reported obtainable as low as \$13. Chicago No. 2 X is quoted at \$17.50 to \$18 and Ohio No. 2 about \$16.50. One of the interesting features of the Southern iron situation here is that one furnace is still quoting \$14 and another \$15 per ton, which is taken to mean that they do not want to make sales.

Coke.—The coke market has continued to drop and quotations for best 72-hr. Connellsville are \$3.25 for both future and prompt shipment. Sales have all been in small lots and large consumers are well protected through the first half, some of them as low as \$2.25 and from that up to \$2.75. By-product coke is salable on the Connellsville basis.

Finished Iron and Steel.—There has been a constant flow of orders, but no large items. The aggregate is reported practically up to that for the same period last month. Shops are seemingly endeavoring to provide against the rush of the spring opening. The agricultural implement and the wagon trades are very heavy. A number of projects involving standard section rails, both steam and electric interurban, are reported taking on new life with likelihood of appearance in the market in the spring. Track fastenings are in fair request. Light rails are in reasonably good demand. Plates are quiet and sheets are in light demand as well as hard to get, the latter condition being largely

responsible for the former. There are no changes in price to report in any division.

Old Material.—The market is quiet and in some instances a little softer, but so little is doing that the figures are really nominal. The rolling mills have put an embargo on purchases while the steel mills, though well supplied, are still willing to take attractive lots at their own figures. There is nothing doing in relaying rails at present. The only list out was one from the Frisco of about 300 tons, which went at low prices. There is a reported possibility of one mill re-entering the market, and if this proves true its capacity is likely to lead to a stiffening of prices. Generally speaking the dealers are waiting for something to turn up and are not inclined to do anything to make things worse. We quote dealers' prices, f.o.b. St. Louis, as follows:

Per Gross Ton.	
Old iron rails	\$13.00 to \$13.50
Old steel rails, re-rolling	15.50 to 16.00
Old steel rails less than 3 ft.	13.00 to 13.50
Relaying rails, standard section, subject to inspection	22.50 to 23.50
Old carwheels	15.00 to 15.50
Heavy melting steel scrap	12.50 to 13.00
Frogs, switches and guards cut apart	12.00 to 12.50

Per Net Ton.	
Iron fish plates	\$11.50 to \$12.00
Iron car axles	20.00 to 21.00
Steel car axles	17.50 to 18.00
No. 1 railroad wrought	11.75 to 12.25
No. 2 railroad wrought	11.50 to 12.00
Railway springs	10.75 to 11.25
Locomotive tires, smooth	12.00 to 12.50
No. 1 dealers' forge	8.50 to 9.00
Mixed borings	6.50 to 7.00
No. 1 busheling	10.50 to 11.00
No. 1 boilers, cut to sheets and rings	7.00 to 7.50
No. 1 cast scrap	11.50 to 12.00
Stove plate and light cast scrap	8.50 to 9.00
Railroad malleable	10.75 to 11.25
Agricultural malleable	8.50 to 9.00
Pipes and flues	7.00 to 7.50
Railroad sheet and tank scrap	7.00 to 7.50
Railroad grate bars	8.50 to 9.00
Machine shop turnings	8.00 to 8.50
Bundled sheet scrap	7.00 to 7.50
Wrought arch bars and transoms	14.50 to 15.00
Steel couplers and knuckles	10.75 to 11.25

British Manufacturers Despondent

New Home Demand at a Standstill—Heavy Stocks of Tin Plates

(By Cable)

MIDDLESBROUGH, ENGLAND, February 26, 1913.

No improvement has occurred in Cleveland pig iron, the general feeling being despondent. New home demand is at a standstill. Steel is dull. Tin plates are weak, it being estimated that 1,000,000 boxes are in stock in Wales. Several Scotch bar-iron mills have closed. New South Wales inquires for 28,000 tons of rails. Stocks of warrant iron are 224,371 tons, against 238,150 tons last week. We quote as follows:

Cleveland pig-iron warrants (closing Tuesday) 60s. 3/4d. against 60s. 4d. one week ago.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 60s. 6d., a decline of 3d.

Steel sheet bars (Welsh) delivered at works in Swansea Valley, £5 12s. 6d., a decline of 2s. 6d.

German sheet bars, f.o.b. Antwerp, 112s. 6d.

German 2-in. billets, f.o.b. Antwerp, 107s. 6d.

German basic steel bars, f.o.b. Antwerp, £5 19s., a decline of 2s.

Steel bars, export, f.o.b. Clyde, £8 5s.

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £7 7s. 6d.

German joists, f.o.b. Antwerp, £5 12s. to £5 15s.

Steel ship plates, Scotch, delivered local yards, £8 7s. 6d.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £9 15s.

Steel rails, export, f.o.b. works port, £6 15s.

Tin plates, cokes, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 14s. 3d. against 14s. 6d. one week ago and 14s. 7 1/4d. two weeks ago.

(By Mail)

Some Signs of Reaction—Two American-European Deals—Export Combine on Tubes

MIDDLESBROUGH, February 14, 1913.

The pig-iron market has been weak and efforts to put warrant prices up or even to keep them steady have been unavailing. The stock argument in favor of higher prices is that the visible supply is continually

falling notwithstanding the fact that January and February are usually months of small shipments, it being argued that as the spring advances and ports now rebound are opened up the clearances from the Tees will increase and cause still greater inroads upon the available supplies. This is problematical, however, for there is no doubt now that things are very much off the boil both here and on the Continent. You have had hints in earlier letters that unfavorable features were developing which might extend, and the possibility foreshadowed has become a fact. I hear that one of the big German electrical works has laid off 4000 hands, while short time in the wire trade in England has become rather frequent and is pretty general as regards common bar iron. Tin plate mills are closing and galvanized sheet makers cannot get enough work to keep going. It is only the activity of the shipyards that gives the steel market a healthy appearance.

An American Company to Sell German Tool Steel

I understand that one of the big independent steel companies in the United States has been so impressed with the excellent quality of some of the German high speed tool steel now being made that it has made arrangements to take practically the present output of one of the largest German works, the quantity involved being a good many hundred tons a year. This is a tribute to the Germans and at the same time a blow to Sheffield. The German firm concerned has been for some time the maker of steel sold by a Sheffield firm of merchants under the merchant firm's own brand.

A very large French works has taken up the manufacture of a patent sheet piling, the property of one of the large American steel companies, and the first lot of material will very shortly be rolled. So far the German rights have not been disposed of, but this will no doubt be proceeded with when the time is opportune. Altogether in one direction and another it is very plain that the Americans are taking a much closer interest than ever in what Europe is doing, and in the trade opportunities presented to them on this side of the Atlantic.

Export Tube Business Concentrated

There has been a very interesting development in the wrought tube trade in the registration of a private limited company which will in future handle the whole of the export trade in tubes and fittings. This should put the British export trade in this class of material upon an entirely different basis from anything seen heretofore. The attempts which have been made to bring about uniformity of selling prices in tubes have been legion but they have all failed when put to the test of bad times and the need of finding markets to absorb ever increasing output. A central selling office is to be set up at Birmingham and the entire overseas business is to be handled there. This is, of course, merely our old friend the German syndicate in a somewhat different form, but one adapted to the special requirements of Great Britain.

Diminished Buying in Germany

With Continued Strength in Some Lines,
Evidences of Slackening Are Shown

BERLIN, February 13, 1913.

The iron trade continues to feel the effects of the uncertainty in the international political situation and the tightness of the money markets. Market reviews speak of reserve on the part of consumers and buyers, particularly in the case of finished products. The scarcity of pig iron and semi-finished steel continues, though in the latter it is apparently less marked than some weeks ago. It speaks well for the iron trade, however, that coal shipments are just now of phenomenal volume, due largely to the demand for industrial grades, domestic qualities being neglected owing to the mildness of the winter.

Pig Production Larger and Stocks Smaller

The strong position of the pig-iron market is indicated by the fact that stocks were further reduced in January despite a considerable increase in production. At the end of the month stocks amounted to 243,000 tons, or 4000 tons less than at the end of December. They amounted to less than five days' production. The January production figures establish another new record at 1,609,714 metric tons, or 16¼ per cent. more than for January, 1912. The previous rec-

ord was held by October, with 1,589,262 tons. It is reported that some supplementary orders for iron for delivery in the current half-year are still coming on the market, but these are only in part finding accommodation. The Syndicate has received inquiries from Belgium for 250,000 tons of basic (Thomas) iron for the second half-year, but in view of the heavy demand from the home market it accepted only orders for 100,000 tons. The scarcity of pig is greatest in qualities containing a high percentage of manganese, owing to the difficulty of obtaining the necessary supplies of ores. The demand for old iron and scrap continues very heavy; and as some consumers embarrassed themselves by unduly waiting to provide for their requirements, a firmer tone has latterly been observed.

The situation in ore is one of undiminished strength. After the advance recently mentioned furnace owners began to place orders for the second half-year; that is, in cases where they are not already provided for through long-term contracts. In brown iron ore the output of the mines has already been about sold out to the end of the year. With minettes the price tends higher, and the richer grades are scarce. Foreign ores have been more freely bought, after lower freight rates made it possible to obtain supplies at somewhat better terms. This applies chiefly to Spanish, Mediterranean, and Black Sea ores, Swedish being delivered almost wholly on long-term contracts. The arrivals of good manganese ores have latterly become more abundant. Germany's imports of iron ores in January amounted to 1,036,000 metric tons, as compared with 816,000 tons in January, 1912.

Premiums on Steel Less Pronounced

In semi-finished steel it is admitted that business for remoter dates has grown quieter. Home consumers have mostly hastened to place orders for the June quarter. The supplies of open-hearth steel for independent mills are still shrinking, inasmuch as producers are consuming their product to a greater extent in their own establishments. In beams buyers are ordering only as their needs demand, the state of the building trades making it unnecessary to enter upon long engagements. The foreign trade continues to take the usual amounts, but in this section of the trade also there is nothing urgent in the calls for delivery. There is a heavy demand for shapes for use in construction shops, but one hears less now about premium-paying for quick delivery than was the case several months ago. Dealers in such shapes are showing considerable hesitation as to placing orders for remoter dates. The volume of business in heavy steel rails is steadily increasing; and in some grades it is reported to be difficult to get the mills to agree to make shipments as desired. Prices for the foreign trade still show a rising tendency. Similar conditions prevail in grooved rails; and the mills are working very briskly on light rails for mines, where prices are also tending upward. The January shipments of the Steel Works Union in steel rails, structural shapes, and semi-finished steel amounted to 535,600 tons, as compared with 532,400 tons in December.

More Weakening in Bars

In bars the situation appears to be further weakening. It is now pretty generally reported that offers are in the market at 2 to 3 marks below the price of 125 marks which had previously been recognized by a kind of tacit agreement of the mills as bottom price. Orders for remoter dates are extremely rare; yet dealers are reported as having but small stocks in hand. In iron bars the situation is satisfactory, and new business continues to come in; the mills are even hoping to adopt higher prices if the war ends soon. They are well employed, and considerable foreign business is still reaching them. The band mills continue to run at their full capacity, and their orders extend far into the future. Good foreign orders are in hand. In cold-rolled bands the home demand has been covered to the end of June but foreign orders run to remoter dates. In strips for tubing the mills are fully employed.

Heavy plates are finding ready sale, and the output of the mills is being fully absorbed despite the increase in the make in the past few months. The mills are finding an outlet in foreign markets for their product to a greater extent than hitherto, apparently in England for the most part. The home trade, on the other hand, is quieter. In medium thicknesses the mills are fully employed, but here, too, dealers are holding aloof. In thin plates the demand is light, and new orders, especially for export, can be placed at a concession in prices. Foreign buying is sluggish.

The deal mentioned about a month ago whereby the Burbach combination was to get control of the Eschweiler Bergwerksverein has now been consummated. The Eschweiler concern is a coal company, the most important one lying to the west of the lower Rhine. Its earnings in the past half-year amounted to 4,000,000 marks. The alliance between the two concerns is for 30 years.

From Belgium an advance of iron bars of 2 shillings a ton for export is reported this week; steel bars also went up one shilling.

From the Briey district of France it is reported that the famous Creusot Company, which manufactures cannon and other supplies for the French army, has decided to erect at Jarny a plant comprising six blast furnaces and a steel mill.

Boston

Boston, Mass., February 25, 1913.

Old Material.—Little scrap is moving. The mills are only buying occasional small lots, and little material is coming out. Prices have not changed in the week. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of \$2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices:

Heavy melting steel	\$10.50 to \$10.75
Low phosphorus steel	13.50 to 14.50
Old steel axles	14.50 to 15.00
Old iron axles	22.50 to 23.00
Mixed shafting	13.50 to 13.75
No. 1 wrought and soft steel.....	10.75 to 11.00
Skeleton (bundled)	9.00 to 9.50
Wrought iron pipe	10.00 to 10.25
Cotton ties (bundled)	9.50 to 9.75
No. 2 light	4.00 to 4.50
Wrought turnings	7.50 to 7.75
Cast borings	7.50 to 7.75
Machinery, cast	13.50 to 14.00
Malleable	10.50 to 11.00
Stove plate	8.50 to 9.00
Grate bars	7.50 to 7.75
Cast-iron car wheels	15.00 to 15.50

Buffalo

Buffalo, N. Y., February 25, 1913.

Pig Iron.—Quiet conditions continue, demand being exceedingly light. Buyers almost without exception merely draw shipments against contracts placed last fall, although in many instances it is becoming apparent that the heavy melting consumption is rapidly depleting their unfilled balances. The few purchases being made are of a special nature as regards grades and specifications. Some basic orders have been received, but they were all for small lots. The total of sales of all grades for the week aggregated not over 10,000 tons. It has been learned that a considerable portion of the total sales of 45,000 tons reported two weeks ago consisted of hot metal for the Lackawanna Steel Company for delivery over the fourth quarter of the year from one of the Susquehanna furnaces of the Rogers-Brown Iron Company, the plants of the two companies being contiguous. It is stated it will comprise the entire output of this one stack for the quarter, aggregating about 39,000 to 40,000 tons of basic. Approximately the same range of prices named in last report holds good for this week, except that the maximum of the list for the higher grades of foundry iron has softened slightly. We quote as follows for second quarter and last half, f.o.b. Buffalo:

No. 1 foundry	\$17.00 to \$17.50
No. 2 X foundry	17.00 to 17.25
No. 2 plain	16.75 to 17.25
No. 3 foundry	16.50 to 17.00
Gray forge	16.25 to 16.75
Malleable	17.25 to 17.75
Basic	18.00 to 18.25
Charcoal, regular grades and analysis.....	18.00 to 19.00
Charcoal, special grades and analysis.....	21.75

Finished Iron and Steel.—Practically all mill agencies report specifications coming in on contracts in a volume equal to or in excess of the tonnage of shipments going out. The only improvement in deliveries noted is in square twisted bars for reinforcing purposes ordered for use this spring, which are now being forwarded from mill in 60 to 90 days from receipt of specifications and for cold-rolled shafting on which shipments are going out approximately 60 days after specification. In bars, plates and shapes the only open dates

for delivery on new contracts are in the fourth quarter. Most of the current placement is again with jobbers at premium prices or with such of the smaller mills as are taking premium business and are not contracting ahead. It is probable a greater tonnage is moving out of jobbers' stocks at present than for a long time, as they are in position to furnish from stock now being received from mills on orders placed last June and July when they ordered very liberally. The week has shown notable activity in track supplies, railroads ordering now for spring repair work. Spikes are currently quoted at \$1.90 for 100 lb., Pittsburgh base, for standard, with usual extras for smaller sizes, but there are indications that slightly higher prices may soon be put in effect. Fabricated structural material shows evidence of increasing activity. Awards on bids for the Hutchinson high school, Buffalo, taking 1400 tons of steel, have been postponed for one week. Plans for the Holy Trinity Church School, Niagara Falls, N. Y., taking 100 tons, will be ready for figures about March 15.

Old Material.—Demand for heavy melting steel continues good at prices about the same as for the previous week. A fair demand is noted in other commodities with the exception of cast borings, for which inquiry has fallen off in a marked degree, local consumers being almost entirely out of the market. The price has consequently taken a decided drop from the exceptionally high level of the last two or three weeks. Export demand from Canada for old carwheels remains active at good prices. With the exception noted above the price schedule remains unchanged. We quote as follows per gross ton, f.o.b. Buffalo:

Heavy melting steel	\$14.00 to \$14.50
Boiler plate, sheared	15.50 to 16.00
No. 1 busheling scrap	12.00 to 12.50
No. 2 busheling scrap	10.00 to 10.50
Low phosphorus steel	17.00 to 17.50
Old iron rails	15.00 to 15.50
No. 1 railroad wrought	14.00 to 14.50
No. 1 railroad and machinery cast scrap.....	13.75 to 14.25
Old steel axles	17.00 to 17.50
Old iron axles	24.00 to 24.50
Old carwheels	15.75 to 16.25
Railroad malleable	13.25 to 13.75
Locomotive grate bars	11.00 to 11.50
Stove plate (net ton)	9.75 to 10.00
Wrought pipe	10.00 to 10.50
Wrought-iron and soft steel turnings	8.25 to 8.50
Clean cast borings	7.50 to 8.00
Bundled tin scrap	18.00

New York

NEW YORK, February 26, 1913

Pig Iron.—Scattered inquiry has come up in the past week, rather more in the aggregate than in either of the two preceding weeks. New England melters have been asking for foundry iron, there being one inquiry for 6000 tons for delivery in the second quarter and another of 1000 tons and two of several hundred tons each. A Brooklyn foundry is in the market for several hundred tons. A fair amount of iron has been asked for at a number of New York State points, including Rochester. The Buffalo furnaces, however, have not done any great amount of business for Eastern shipment. Around New York City the situation is still very much of a waiting one. As indicating the general trend, there is interest in local pig-iron offices in the inquiries for pipe iron which have come up in eastern Pennsylvania and New Jersey, two buyers being in the market for several thousand tons each. While eastern Pennsylvania steel works have not shown any interest recently in basic iron a steel plant in western Maryland has come out with an inquiry for 4500 tons—750 tons a month over a half-year. Mahoning and Shenango valley furnaces, with about \$1.50 freight, could deliver iron at Cumberland at \$17.75 on a quotation of \$16.25 at furnace. Virginia furnaces with \$2.30 freight would make their delivered price \$17.80 if they adhered to \$15.50 at furnace. Central and eastern Pennsylvania furnaces would need to go below any recent quotations in order to compete with the other two districts mentioned. It is probable that Pennsylvania makers would sell basic at \$17.75 at eastern Pennsylvania steel works or lower. We quote as follows for Northern iron at tidewater: No. 1 foundry, \$18.25 to \$18.50; No. 2 X, \$17.75 to \$18.25; No. 2 plain, \$17.50 to \$17.75. Southern iron is quoted at \$18.50 to \$18.75 for No. 1 foundry and \$17.75 to \$18.25 for No. 2.

Structural Material.—That fabricators and erectors are feeling the present pessimism of financial interests is perhaps the leading feature of the market, as certainly new projects are not brought to a conclusion

very rapidly and it follows that these handlers of structural material find less and less on their books for future work. It is yet a little early for the movement of small business with spring building operations, while contractors for large work do not report much in sight in the metropolitan district, though outside of the city there is considerable activity. At the same time deliveries on material have been bettered little if any and it takes eight to ten weeks to get standard material. The new work which has come into the market includes 250 tons for the Flower Hospital, Sixty-fourth street and Avenue A; and 400 tons for an addition to the Woman's Hospital at 110th street which shortly come in the market. Recent awards include 850 tons for the McMorro Building, West Thirty-fifth street, to the Hinkle Iron Company; 350 tons for the Mead-Morrison shops, East Boston, Mass., to the Levering & Garrigues Company; 200 tons for the Standard Mail Order Company's warehouse, Fifty-fifth street, near Eighth avenue, to the Harris H. Uris Iron Works; 500 tons for the Good Samaritan Hospital, Troy, to the Noelke-Richards Iron Works; 150 tons for a bridge for the Baltimore & Ohio, to the Mount Vernon Bridge Company; 250 tons for a pulp mill at Stillwater, Me., to the Cambria Steel Company, and 650 tons of fabricated material for the Norfolk & Western, to the American Bridge Company. It is understood that the remainder of the Norfolk & Western work, including the erection, has been given to the Virginia Bridge & Iron Works. The building for the General Vehicle Company, Long Island City, is to be of reinforced concrete. One unusual incident was the closure of a contract of several hundred tons fabricated and delivered by May 1 at a low price. Plain material obtains 1.76c. for mill shipments for delivery in eight to ten weeks, but 1.61c. to 1.66c. New York, for delivery in the third quarter. From store the price is 2.25c., New York.

Plates.—Railroad car buying is still conspicuous for its absence, but while in some quarters this is taken to indicate an adverse feeling on the part of financial interests with the promise of business later in the year, it is to be remembered that much of the cars already contracted for will not be delivered until the last quarter, and that many car builders cannot deliver inside of seven months. The obstacles to rapid production include the delay in the delivery to car builders of car couplers, air-brake material and other specialties, and also to a shortage of labor to maintain maximum operation. Mixed reports are received like the following: One railroad, which has undertaken to build a considerable number of cars for itself, is experiencing considerable difficulty in placing the contract for plates, while another company is offering plates at the price of steel bars, or 1.40c., Pittsburgh, though the delivery must be at the convenience of the mill. The Havana Central is inquiring for 50 general service cars, 100 flat cars and 450 box cars, and the following companies are also regarded as in the market: The Mineral Iron Range for 100 rock ballast cars, the Utah Railroad for 500 and the Toledo, St. Louis & Western for 1000 box cars. The American Car & Foundry Company is to furnish 45 storage-battery cars for the New York Railways. Quotations are 1.61c. to 1.66c., New York, for mill shipments in the third quarter and 1.76c., for shipment in six to eight weeks, with \$1 a ton additional for universal plates, which, however, can be had in three to five weeks.

Bars.—Specifications on contracts in the East are still heavy and consumers find it difficult to place new business. In fact numbers have specified definitely seven months ahead. An increase in volume of specifications is noted in the bar iron market and as this has for some time been heavily loaded, the extra demand is not altogether welcome from the mill standpoint. Steel bars are quoted at 1.40c., Pittsburgh, or 1.56c., New York, delivered at the convenience of the mill, which is commonly more than three months hence, but they remain 2.10c. from store; shipments in one or two months go at prices between the extremes, though this business does not total very much. Refined iron bars are quoted at 1.70c. to 1.80c., New York, and from store are 2.15c.

Cast Iron Pipe.—The city of Fall River, Mass., will open bids on 340 tons March 3, and on the same day the Metropolitan Water Board of Boston will open bids on 400 tons. The city of Boston readvertises the opening of bids on March 6 on 700 tons of special castings for high pressure service. Buying on private account continues, and it is believed that more tonnage of this character is now on the books of the pipe companies than usual at this season. The Atlantic City contract for 2200 tons of 48 in. was secured by

the leading interest at \$22.25 per net ton, delivered; the next lowest bid being \$22.60. The Hartford contract for 1600 tons went to a Delaware River foundry at \$23.95, delivered; the contract calling for 6 to 24 in. The lower prices now coming out on bids are ascribed to the weakening in pig iron. Quotations on carload lots of 6 in. are \$24 to \$25 per net ton, tidewater.

Old Material.—Dullness rules the market. Consumers of steel scrap are apparently not interested in offers and would probably have to be tempted by quite low prices to make any purchases whatever. Rolling mills appear to be doing nothing in the purchase of old material, although they are still extremely busy. Foundries are holding off, evidently influenced by the weakness in pig iron. Eastern Pennsylvania steel companies are making heavy rejections of material now being delivered on contract. It is the disposition of dealers not to buy anything for their yards in view of the abundant supply now in sight, but will only purchase strictly merchantable material when they are able to use it in making deliveries applicable on contracts. Dealers' quotations are as follows, per gross ton, New York and vicinity:

Old girder and T rails for melting	\$10.50 to \$11.00
Heavy melting steel scrap	10.50 to 11.00
Relaying rails	22.00 to 22.50
Re-rolling rails (nominal)	14.00 to 14.50
Iron car axles	24.00 to 24.50
Old steel car axles	16.00 to 16.50
No. 1 railroad wrought	13.00 to 13.50
Wrought-iron track scrap	12.50 to 13.00
No. 1 yard wrought, long	11.50 to 12.00
No. 1 yard wrought, short	10.50 to 11.00
Light iron (nominal)	5.00 to 5.50
Cast borings	7.75 to 8.25
Wrought turnings	8.00 to 8.50
Wrought pipe	10.00 to 10.50
Old carwheels	14.50 to 15.00
No. 1 heavy cast, broken up	11.50 to 12.00
Stove plate	8.75 to 9.25
Locomotive grate bars	8.00 to 8.50
Malleable cast	11.00 to 11.50

Ferroalloys.—The quotation for 80 per cent. ferromanganese is unchanged at \$65, Baltimore, for both prompt and future deliveries and the market is quiet. One interest, acting on the supposition that the tariff duty on ferromanganese is to be increased, has made tentative inquiries for 500 tons, but offers a price that sellers assert to be too low for consideration. Ferrosilicon, 50 per cent., also is without change, and quiet at \$75, Pittsburgh, for carloads, \$74 for 100 tons and \$73 for 600 tons and over.

Metal Market

NEW YORK, N. Y., February 25, 1913.

The Week's Prices

Cents Per Pound for Early Delivery.

Feb.	Lake.	Electro-lytic.	Tin, New York.	Lead—		Spelter—	
				New York.	St. Louis.	New York.	St. Louis.
20.....	15.00	14.87½	48.60	4.35	4.20	6.25	6.10
21.....	15.00	14.87½	48.55	4.35	4.20	6.25	6.10
24.....	15.00	14.75	47.70	4.35	4.20	6.25	6.10
25.....	15.00	14.75	47.70	4.35	4.20	6.25	6.10
26.....	15.00	14.75	48.50	4.35	4.20	6.25	6.10

Copper is quiet with a downward tendency in prices. Tin is lower and activity is moderate. Lead holds up in price but business is lacking. Spelter is dull and weak. Antimony is lower and inactive.

New York

Copper.—The market has been quiet in the last week with a slight downward tendency. Lake has been held at 15c. cash, New York, but electrolytic has eased off and is now quoted at about 14.75c., cash New York, or 14.87½c. delivered, cash 30 days. At this level there was some business done in electrolytic, and while no large amount was involved the buying was sufficient to prevent the market from becoming stagnant. An evidence of the weaker tendency is contained in a partially confirmed rumor that electrolytic has been offered for delivery in the Naugatuck Valley on the basis of 14.75c., cash 30 days. The sentiment on the part of consumers is bearish and it is not uncommon for them to make definite offers at below the market price in their quest for cheap metal. The existing situation is made possible by the failure of Europe to buy and very little hope is entertained that there will be any real steadiness until foreign buyers make themselves felt. The price in London to-day is £63 17s. 6d. for spot and £64 for futures. Exports make a better showing and the total for the month is 24,047 tons.

Pig Tin.—Only a fair amount of this metal changed hands in the last week despite the lower prices. On February 20 there was a fair business, but the next day there was nothing doing. On February 24 there was only moderate trading, although yesterday a fairly

large amount estimated as between 400 and 500 tons was sold, deliveries to be as far ahead as September. Consumers seem disposed to stay out of the market, not alone because of prices but because they are pretty well supplied so far as present needs go. All the tin now being delivered on contract cost the users more than prevailing prices and they evidently do not want to get caught that way again. The violent fluctuations which have characterized the London market of late continue and bear influences in the last week have been pounding the market. They have been doing it successively in view of the fact that the overbought condition of American consumers precluded any sustaining power from here. As soon as the bear operators have acquired the metal they want at advantageous terms they will switch their tactics and then the American consumers who are not supplied may face the necessity of paying high prices again. The price in New York to-day is 48.50c., as against 47.70c. yesterday, the change being due to advances abroad. The extent of London fluctuations may be realized from the fact that spot tin is quoted to-day at £218 10s. as against £212 10s. yesterday, while futures are quoted at £211 to-day as against £206 10s. yesterday. There is afloat 3320 tons and arrivals this month have been 3692 tons.

Lead.—The week has been extremely dull. Some good sales could be made of special brands if these were available, but they are not, while for the ordinary brands there is practically no demand. Prices are unchanged at 4.35c., New York, and 4.20c., St. Louis.

Spelter.—The price of spelter is down to 6.25c., New York, and 6.10c., St. Louis, and the metal is dull and weak at these figures. It is frankly admitted that lower prices may be expected.

Antimony.—This metal has maintained its course of irregularity in the last week. It is dull, and what buying there has been has followed considerable shopping. Cookson's is quoted at 8.75c. to 8.87½c.; Halllett's at 8.62½c. to 8.75c., and Chinese and Hungarian grades at 8.25c. to 8.50c.

Chicago

FEBRUARY 24.—Metal prices generally are subject to a wide range of prices, quotations being made to fit individual transactions. Copper is lower and tin has fluctuated considerably, with a net downward tendency. Spelter quotations show decided weakness, with the more marked quotations for quantity purchases. We quote as follows: Casting copper, 15c.; Lake, 15.50c., in carloads for prompt shipment; small lots, ¼c. to ¾c. higher; pig tin, carloads, 49.50c.; small lots, 51.50c.; lead, desilverized, 4.30c. to 4.35c. for 50-ton lots; corrodng, 4.55c. to 4.60c. for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 6.30c. to 6.35c.; Cookson's antimony, 10.50c., and other grades, 9.75c., in small lots; sheet zinc is \$8.50, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots: Copper wire, crucible shapes, 13c.; copper bottoms, 11.75c.; copper clips, 12.75c.; red brass, 12c.; yellow brass, 9c.; lead pipe, 3.80c.; zinc, 4.35c.; pewter, No. 1, 33c.; tin foil 39c.; block tin pipe, 45c.

St. Louis

FEBRUARY 24.—The market has been rather quiet, with little change in prices except for a stiffer feeling in spelter, with lead firm. The quotations to-day are: Lead, 4.22½c. to 4.25c.; spelter, 6.17½c. to 6.20c.; tin, 48.20c. to 48.30c.; Lake copper, 15.60c. to 15.65c.; electrolytic, 15.35c. to 15.40c.; antimony, Cookson's, 9.55c. to 9.65c. In the Joplin ore market a better feeling prevailed and the range of the basis price of ore, 60 per cent., was for zinc blende, \$45 to \$49 per ton, while the price of the choicest lots ran as high as \$52. There was considerable co-operation on the part of producers which helped materially in strengthening the market. While the top prices indicate only an advance of \$1 per ton, it was really greater, as the general tone of the market was higher and the second grades brought \$2 to \$3 per ton more than a week previous, producers refusing to sell at offers. In calamine the price range for 40 per cent. was \$25 to \$27, while the best lots sold as high as \$31. The demand was good. Lead ore was quiet, but rather better in tone with the price at \$53.50 for 80 per cent. For miscellaneous scrap metals we quote as follows: Light brass, 5.50c.; heavy brass and light copper, 9c.; heavy copper and copper wire, 11c.; zinc, 4c.; lead, 3.50c.; tea lead, 3c.; pewter, 25c.; tin foil, 36c.

Frank L. Crobaugh, 1501 Columbus road, Cleveland, Ohio, has issued a booklet giving "Some Hints on Taking Samples for Analyses." These hints relate to ores, limestone, coal, coke, pig iron, steel, alloys, scrap, etc.

Iron and Industrial Stocks

NEW YORK, N. Y., February 26, 1913.

Unfavorable influences continue to predominate in the stock market. At times the market has recently approached the verge of demoralization. Special weakness has developed in some of the industrial stocks, such as American Can and certain other stocks recently brought out and which have perhaps not been held by strong hands. For the first time in many months United States Steel common has fallen below 60. The principal reasons assigned for the persistent decline in stocks are the fear that intervention in Mexican affairs may become necessary and the persistent scarcity of money in Europe together with the approaching change in the National Administration and its possible reversal of Government policies. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week has been as follows:

Am. Can., com.....	31½-40¾	Pressed Steel, pref.,	97¼-98½
Am. Can., pref.....	118-124	Railway Spg., com.,	24¼-30
Am. Car & Fdy., com.,	47½-51	Railway Spg., pref.,	99-99½
Am. Car & Fdy., pref.,	112-115½	Republic, com.....	24¾-25¼
Am. Loco., com.....	33½-37½	Republic, pref.....	85
Am. Loco., pref.....	104¾	Rumely Co., com.,	64-79½
Am. Steel Foundries.....	35	Rumely Co., pref.,	91-94
Bald. Loco., com.....	46½-48½	Stloss, com.....	35
Bald. Loco., pref.....	104	Pipe, com.....	14-14½
Beth. Steel, com.....	35-37	Pipe, pref.....	54½-55½
Beth. Steel, pref.....	64½-67½	U. S. Steel, com.....	59½-62½
Case (J. I.), pref.....	100½-102½	U. S. Steel, pref.....	107¼-108½
Colorado Fuel.....	31½-34½	Va. I. C. & Coke.....	44¼-50
Deere & Co., pref.,	98-99	Westinghouse Elec.,	68-70½
Emer-Brant, com.....	50-61	Chic. Pne. Tool.....	49¼-49½
Emer-Brant, pref.....	91-92	Cambria Steel.....	49½-51¼
General Electric.....	135¼-139¼	Lake Sup. Corp.....	27-28
Gr. N. Ore Cert.....	33-36	Pa. Steel, pref.....	92-93
Int. Harvester, com.,	106-109	Warwick.....	10½
Int. Harv., pref.....	112½-112¾	Crucible Steel, com.,	15¼-16
Int. Pump, pref.....	57	Crucible Steel, pref.,	92-92½
Lackawanna Steel.....	43-46½	Harb. Wk. Ref., com.,	50
Nat. En. & St., com.,	14¼-16¼	Harb. Wk. Ref., pref.,	101¼
Pittsburgh Steel, pref.,	97¼	La Belle Iron, com.,	49-52
Pressed Steel, com.,	25-31	La Belle Iron, pref.,	127-128½

Dividends Declared

The National Enameling & Stamping Company, regular annual, 7 per cent. on the preferred stock, payable in installments of 1¼ per cent. each, beginning March 31, and payable every three months thereafter.

The New York Air Brake Company, regular quarterly, 1½ per cent., payable March 18.

Personal

Charles Brady of Cleveland, Ohio, has been appointed general manager of the plant at Manitowoc, Wis., of the Aluminum Castings Company of Cleveland, succeeding Conrad Werra, who recently resigned to organize the Waukesha Aluminum Company.

At the annual meeting of the Manufacturers' Bureau of Indiana, Melville W. Mix was unanimously re-elected president for the fourth time. He is president of the Dodge Mfg. Company, manufacturer of power transmission machinery, Mishawaka, Ind., one of the founders of the Efficiency Society and is prominently identified with the National Association of Manufacturers.

Julian Kennedy, Pittsburgh, spoke before the Women's Club League in Youngstown, Ohio, on the evening of February 19, on "Smoke Prevention."

J. H. Gilmore, auditor and assistant treasurer of the LaBelle Iron Works, Steubenville, Ohio, will resign March 1 to become secretary and treasurer of the Best Mfg. Company, Oakmont, Pa.

R. B. Titsworth, chief contracting engineer of the McClintic-Marshall Construction Company, Pittsburgh, has resigned to become connected with the Detroit Bridge & Steel Company, Detroit, Mich. He is succeeded by C. H. Harlan, formerly structural engineer for the McClintic-Marshall Company.

L. M. Hartzel, for eight years superintendent of the 28 and 38 in. blooming mills at the Homestead works of the Carnegie Steel Company, has resigned, effective March 1, and has been succeeded by S. T. Paisley.

William G. O'Malley, for a number of years general master mechanic of the Lackawanna Steel Company, Buffalo, N. Y., has accepted a position with the Pittsburgh Crucible Steel Company, having full charge of all construction work in connection with the building of its new plant at Midland, Pa.

Earl C. Cowgill, secretary M-C-B Company, with offices in the McCormick Building, Chicago, has resigned to take the management of a Mississippi plantation.

W. C. Free, president Free Sewing Machine Company, has taken up residence at Rockford, Ill.; coincident with the removal of the general offices of the company from Chicago to the factory.

E. J. Monahan, formerly traveling auditor for the Carnegie Steel Company in the New Castle and Pittsburgh districts, with headquarters at Farrell, Pa., will remove March 1 to Youngstown, Ohio, where he will be employed in a similar capacity for the Youngstown and Cleveland districts.

Harry B. Guy, for some years connected with the Ohio Works of the Carnegie Steel Company at Youngstown, and later with the firm of Guy & Cooke, manufacturers' agents, Youngstown, has been appointed assistant purchasing agent of the Cambria Steel Company, and will have charge of the stock rooms and the distributing of supplies in Johnstown, Pa.

E. S. Roche, manager of the Bury Compressor Company, Erie, Pa., sailed last week for a six weeks' European trip.

L. F. Hussey, recently advertising manager of the Standard Tool Company, Cleveland, Ohio, has become connected with the publicity department of the National-Arne Mfg. Company, Cleveland.

E. H. Mansfield, for several years representative of the Pittsburgh Crushed Steel Company, Pittsburgh, Pa., abrasive manufacturer, has resigned to associate himself as district sales agent to cover the New England territory with the Thomas W. Pangborn Company, sandblast specialist, Hagerstown, Md. He will make his headquarters at Springfield, Mass.

Official announcement was made by President Henry S. Drinker at a college meeting February 21 of the gift to Lehigh University, South Bethlehem, Pa., of a large modern gymnasium and stadium by Charles L. Taylor of Pittsburgh, former partner of Andrew Carnegie. Dr. Drinker also read an extract from the will of John Fritz, giving his residuary estate, amounting to about \$150,000, to Lehigh University primarily as an endowment fund for the maintenance of the Fritz Engineering and Testing Laboratory, which Mr. Fritz gave to the university in 1910. This laboratory is one of the best equipped of its kind in the world, and its construction and equipment were personally supervised by Mr. Fritz.

John M. Sherrerd, Easton, Pa., well known throughout the country as an expert in the manufacture and use of manganese steel, recently became connected with the Titanium Alloy Mfg. Company, Niagara Falls, N. Y. He was with the Taylor Iron & Steel Company some 18 years and before that was for about 14 years chief chemist and metallurgist to the Troy Steel & Iron Company.

L. Olarte, of Paris, is in this country with a view of establishing connections as a French representative of American manufacturers. His home address is 23, rue d'Athene, and he has close relations with some large French companies. Two important movements alluded to by Mr. Olarte in an interview are the growing tendency in France to draw away from dependence on German manufacturers and the increasing investment of French capital in American enterprises. In his opinion commercial relations between France and the United States should be much closer than they are.

The Roanoke Bridge Company, Roanoke, Va., announces that J. H. Gray, formerly of the J. H. Gray Company, New York, has accepted a position as general manager of the company.

P. E. Zimmerman, general manager of the Hagstrom Bros. Mfg. Company, Lindsborg, Kansas, has resigned from that position and will act as the State representative for a leading motor cycle factory. He will be succeeded in the management by Charles Lander, the president of the company. Mr. Lander has served in the legislature and is now vice-president of the Board of Regents of the State normal schools.

George G. Crawford, president Tennessee Coal, Iron & Railroad Company, Birmingham, Ala., has returned from a Panama trip.

Herbert Du Puy, chairman of the Crucible Steel Company of America, Pittsburgh, has gone to California for an extended stay. C. C. Ramsey, president of the company, has returned from Europe.

James J. Flannery, president American Vanadium Company and Flannery Bolt Company, Vanadium Building, Pittsburgh, announces the appointment of F. H. Allison as general purchasing agent in charge of all office and factory supplies for both these companies.

Charles E. Roberts, for many years connected with Fitz, Dana & Co., has been made general manager of the iron and steel department of the E. P. Sanderson Company, 36-39 Washington street, north, Boston, Mass.

Dr. Edward G. Acheson, Niagara Falls, N. Y., while visiting St. Petersburg, Russia, for the purpose of addressing the Russian Imperial Technological Institute on the nature and use of his lubricant, was presented by the Czar of Russia with the insignia and sash of the Order of St. Anne. The decoration was conferred by Premier Kokovtsov at the American Embassy, St. Petersburg, at a dinner given in honor of Dr. Acheson.

William Mitchell Lewis, president and general manager of the Mitchell-Lewis Motor Company, Racine, Wis., has resigned as executive head to devote his entire attention to other interests. He is succeeded by Joseph Winterbotham, Jr., of Chicago.

Henry R. Towne, president Yale & Towne Mfg. Company, has been re-elected president of the Merchants' Association of New York. This is the sixth time that he has been chosen to fill the position.

Obituary

Dr. GUSTAF PATRIK DE LAVAL, who died at Stockholm, Sweden, February 2, in his 68th year, was best known as the inventor of the cream separator and the steam turbine. He was trained as an engineer at the Technological College at Upsala which he left in 1866, having paid special attention to the engineering problems of shipbuilding and the textile industry. He started the first Swedish sulphuric acid plant at Falun and managed it until 1874, later starting a glass blowing works. He became engineer of the Kloster Iron Works, where he installed a galvanizing plant and introduced the Bessemer process. He interested himself in the problem of separating cream from milk by mechanical means, but capitalists to whom he broached the idea of employing centrifugal force could see little in it. The original machine consisted of a bowl with a circumferential baffle. The milk was allowed to fall to the bottom of the bowl and rose along the walls. Owing to centrifugal force, the cream was supposed to come up over the rim of the baffle plate. The capital of the inventor was soon spent in experimenting, but he borrowed 3000 crowns from a relative and by early 1878 the first machine was ready. Mechanical difficulties caused many disappointments, but by the end of 1880 de Laval and Oscar Lamm, his partner, had sold 116 separators, and in 1883 the first separator company was organized. Progress from that time was uninterrupted and the separator has become known throughout the world. The steam turbine which bears his name was patented by de Laval in 1889. In late years he entered politics and was a member of the Swedish House of Representatives at the time of his death.

FRANK DANA, of Dana & Co., 32 Broadway, New York, importers and dealers in metals and ferromanganese, died February 21 at his home in Brooklyn, aged 67 years. While he had been ill for many months and of late had been unable to go to his office, his death was unexpected. Heart disease was the cause. He was associated in business with his brother, Frederick A. Dana, and had been engaged in the metal business nearly 40 years. Dana & Co. are the sole representatives in this country of the Wigan Coal & Iron Company, Wigan, England, manufacturer of ferromanganese.

MICHAEL EHRET, a pioneer manufacturer of coal tar products, chairman of the Barrett Mfg. Company, and president of the Warren-Ehret Company and the Ehret Magnesia Mfg. Company, died at his home in Philadelphia, Pa., February 17, aged 75 years.

FRANK A. THAYER, treasurer and director of the Baldt Steel Company, New Castle, Del., and of the Federal Terra Cotta Company, died at his home in Ridgewood, N. J., February 22, aged 56 years.

Pittsburgh and Vicinity Business Notes

William Swindell & Brothers, Pittsburgh, have received a contract for the building of the open-hearth and heating furnaces and gas producer plant for the Alton Steel Company, Alton, Ill.; a contract for the rebuilding of an open-hearth furnace for the Union Steel Casting Company, Pittsburgh; also one for the building of additional open-hearth furnaces for the Washington Steel & Ordnance Company, Washington, D. C.

The Brier Hill Steel Company, now building an open-hearth steel plant at Youngstown, Ohio, has placed contracts with Heyl & Patterson, Inc., Pittsburgh, for coal handling and crushing equipment; with the General Electric Company, Schenectady, N. Y., for the powerhouse switchboard and electric locomotive; with the Westinghouse Electric & Mfg. Company, Pittsburgh, for controller equipment for cranes and motors, and with the Bowes-Adams Company for hydraulic valves.

The Whitaker-Glessner Company, Wheeling, W. Va., is in the market for a 300-kw. four-valve engine and generator to be installed in its Martins Ferry works.

On account of the great activity among the mills located at Tarentum, Brackenridge and Natrona, Pa., the banks in these places did not close on Washington's Birthday, as has been their previous custom. It happened that that day was pay day with many of the mills, and in response to a general request from the mill owners the banks remained open to honor the pay checks.

The Union Steel Casting Company, Pittsburgh, operates two plants, its No. 1 works having two open-hearth furnaces and No. 2 works three furnaces, all of 25 tons capacity. One of the open-hearth furnaces in No. 1 works, erected 10 years ago, is now being rebuilt, much of the iron work and other equipment being worn out. This company has no other new work or additions planned or under way at present.

The order for 4500-steel coke cars recently placed by the Pennsylvania Railroad with the Cambria Steel Company is said to be the largest single order for cars ever taken by the latter.

W. D. McKeefrey, vice-president of the Salem Iron Company, operating a blast furnace at Leetonia, Ohio, states that he has no knowledge of the reported open-hearth steel plant to be built at Leetonia. The company expects to start its blast furnace early in the summer.

The Snyder Mfg. Company, Logan, Ohio, will build a new plant for the manufacture of furniture, plans and specifications for which are now being drawn by the Osborne Engineering Company, Cleveland, Ohio. The company is in the market for an extensive line of wood-working machinery.

J. J. O'Connor, former president of the Washington Tin Plate Company, Washington, Pa., and M. A. Mackey, former sales manager for the McClure Company, tin plate and metals, have formed a copartnership, under the firm name of J. J. O'Connor & Co., room 704 First National Bank Building, Pittsburgh, and will sell tin, spelter, copper, antimony, aluminum, lead, babbitt, solder, stereotype and linotype metal, as well as palm oil and lubricating oils. The new firm has made selling arrangements with some large New York metal houses having foreign connections.

The Latshaw-Bradley Machinery Company, People's Bank Building, Pittsburgh, has been appointed representative in the Pittsburgh district for Clark Brothers, Olean, N. Y., for their complete line of steam engines, ranging from 75 to 200 hp. The types of engines include heavy duty double-valve, two-valve automatic, heavy duty Corliss, heavy duty high-speed Corliss and heavy duty tandem compound Corliss.

The business and plant of the Joliet Rolling Mill Company, Joliet, Ill., have been taken over by a new organization to be known as Frederick Cowan & Co., Inc. The officers of the new company thus far announced are C. A. Bickett president and Frederick Cowan vice-president. The mill is now in operation, but is being overhauled and will be enlarged as rapidly as is feasible. The new company will be a factor in the general market for the products that have been rolled in the past and will increase its lines as conditions warrant. The Chicago sales office is to be located at 505 McCormick Building, and the old sales organization is being retained.

Canada's New Steel Center.—The name selected by the United States Steel Corporation for the new town it will build in connection with its steel works in the Sandwich district of Ontario, opposite Detroit, is Pontiac, after the famous Indian chief. The bill for the incorporation of the new municipality has been approved by the Dominion cabinet and is now before the Ontario legislature.

Alabama Consolidated Reorganization.—It was announced at Baltimore February 21 by the committee which has been at work for some time on the plan of reorganization, that it is now operative. Under the plan the property will be bid in on foreclosure proceedings and taken over by a new corporation with a capital of \$6,719,000.

A certain portion of the sales department bonus system fund established by the Pennsylvania Steel Company was set aside in the year 1912 to be awarded by the head of the sales department to individuals in the department who should accomplish conspicuously efficient pieces of work during the year. The head of the department has selected seven men for this distinction, the first award being made to Robert E. Belknap, Western sales manager at Chicago for exceptional rail sales.

The American Screw Company, Providence, R. I., has purchased the business of the Rogers Screw Company of that city, and will operate the plant under the name of the Rogers Mills, following its policy of preserving the identity of its individual works. The Rogers business was established in 1889, and the capital stock is \$250,000. It is stated at Providence that Olney Arnold will be retained by the new owner and that Henry R. Rogers will remain as superintendent of the plant.

Corrigan, McKinney & Co., Cleveland, Ohio, have sent out an inquiry for a 22-in. combination rail mill that can be converted into a mill for rolling sheet bars, billets and structural material. Plans are being prepared for a continuous merchant mill for rolling various forms of merchant steel. It is their intention to place shortly a number of contracts for equipment for their new steel plant. The only contracts so far placed are for the building and foundations.

The Humboldt Engineering Works Company, Kalk, near Cologne, Germany, was the builder of the plant at the Krupp works, Rheinhausen, for making briquettes from blast furnace flue dust by the Scoria process, as described in *The Iron Age* of February 20, page 488. The illustrations accompanying the article were from the drawings of the Humboldt company.

The Colorado Fuel & Iron Company declared a dividend February 13 of 35 per cent. on its \$2,000,000 preferred stock, payable March 20. This is a little less than half the unpaid dividends which have accrued in the past 10 years on the stock. It is entitled to dividends of 8 per cent. a year, none of which was paid from 1893 to 1912.

Hearings in the Government suit against the Steel Corporation were to have been resumed at New York on Tuesday, February 25, but owing to the illness of James Gayley, who was to have appeared as a witness there was a further postponement to Friday, February 28.

The plant of the Warren City Tank & Boiler Company, Warren, Ohio, was burned February 24, causing a loss estimated at \$200,000. President A. R. Hughes states that temporary arrangements will be made to care for pending contracts. The plant will probably be rebuilt.

Frank Samuel, Philadelphia, Pa., has purchased the blast furnace stack and entire equipment of the Franklin Iron Mfg. Company's plant at Franklin Springs, N. Y., and will dismantle it.

The A. P. Witteman Company, manufacturer of steel forgings, has removed its office, hitherto located at 112-116 North Broad street, Philadelphia, to its plant at Chester, Pa.

Symposium on Sound Steel Ingots

(Continued from page 549)

The Attendance

The attendance of the meeting was large and notable for the caliber of the participants. A large number of metallurgists, railroad engineers and others interested in the making of steel or concerned in its use had signified their intention to be present, and among these were the following, most of whom were noted at the meeting, in addition to those mentioned in the foregoing account of the discussion:

- F. W. Wood, president, Maryland Steel Company, Sparrows Point, Md.
 F. D. Carney, general superintendent, Pennsylvania Steel Company, Steelton, Pa.
 W. H. Rowe, president, Pittsburgh Steel Company, Pittsburgh.
 G. A. White, American Sheet & Tin Plate Company, Vandergrift, Pa.
 Robert H. Watson, Standard Iron Company, Ltd., Toronto.
 A. H. Beale, district manager, American Sheet & Tin Plate Company, Vandergrift, Pa.
 T. Jobson, Crucible Steel Company of America, Harrison, N. J.
 James E. York, York Rolling Process Company, New York City.
 Edwin H. Martin, Cleveland, Ohio.
 C. P. Mills, chief of inspection department, Portsmouth Steel Company, Portsmouth, Ohio.
 R. F. Ray, assistant engineer, Missouri Pacific Railway Company, St. Louis, Mo.
 Daniel Simonds, president, Simonds Mfg. Company, Fitchburg, Mass.
 W. R. Shimer, Bethlehem Steel Company, South Bethlehem, Pa.
 J. W. Deetrick, general manager, Republic Iron & Steel Company, Youngstown, Ohio.
 Charles H. Rich, chief metallurgist, Alan Wood Iron & Steel Company, Philadelphia.
 F. N. Speller, metallurgist, National Tube Company, Pittsburgh.
 S. M. Rodgers, metallurgist, American Steel & Wire Company, Pittsburgh.
 Dr. John A. Mathews, general manager, Halcomb Steel Company, Syracuse, N. Y.
 Prof. Gaetano Lanza, Philadelphia.
 J. G. Morrow, inspecting engineer, Steel Company of Canada, Ltd., Hamilton, Ont.
 Dr. George W. Sargent, third vice-president and metallurgist, Crucible Steel Company of America, Pittsburgh.
 T. H. Gatlin, assistant chief engineer, maintenance of way and structures, Southern Railway Company, Washington, D. C.
 J. C. Ramage, superintendent of tests, Southern Railway.
 C. E. W. Rys, metallurgical engineer, Carnegie Steel Company, Pittsburgh.
 G. G. Thorp, second vice-president, Illinois Steel Company, Chicago.
 K. L. Ahles, Sweet's Steel Company, Williamsport, Pa.
 William Larimer Jones, Jones & Laughlin Steel Company, Pittsburgh.
 G. Aertsen, Midvale Steel Company, Philadelphia.
 W. P. Barba, Midvale Steel Company.
 B. DeMare, Midvale Steel Company.
 Chas. G. Osborne, metallurgical engineer, Illinois Steel Company, South Chicago.
 C. H. Stein, engineer, maintenance of way, Central Railroad of New Jersey, Jersey City, N. J.
 E. R. Ashby, chief engineer, Lehigh Valley Railroad, New York.
 J. R. Savage, chief engineer, Long Island Railroad, Jamaica, N. Y.
 A. S. Henry, vice-president, Railway Steel-Spring Company, New York.
 James A. Burden, Burden Iron Company, Troy, N. Y.
 B. J. Fallon, engineer, maintenance of way, Metropolitan West Side Elevated Railroad, Chicago.
 Paul Kreuzpointner, Altoona, Pa.
 Prof. Arthur L. Walker, Columbia University, New York.
 C. S. Marshall, manager, operating department, American Steel & Wire Company, Worcester, Mass.
 G. M. Goodspeed, National Tube Company, McKeesport, Pa.
 Dr. S. V. Hunnings, chemist and engineer of tests, American Locomotive Company, Schenectady, N. Y.
 F. H. Mead, metallurgist, H. H. Franklin Mfg. Company, Syracuse, N. Y.
 R. B. Owens, secretary, Franklin Institute, Philadelphia.
 E. F. Kenney, Cambria Steel Company, Johnstown, Pa.
 W. R. Walker, assistant to the president, United States Steel Corporation, New York.
 S. T. Wellman, Cleveland.
 C. W. Gennet, Jr., Robert W. Hunt & Co., Chicago.
 A. A. Stevenson, vice-president, Standard Steel Works Company, Philadelphia.
 John Birkinbine, Philadelphia.

Dr. Richard Moldenke, Watchung, N. J.
 T. W. Robinson, first vice-president, Illinois Steel Company.
 C. S. Robinson, second vice-president, Youngstown Sheet & Tube Company.
 H. A. Barren, superintendent, blast furnaces and steel works, American Steel & Wire Company, Pittsburgh.

Continuation Schools Urged for New York City

A plan of industrial training for children more than 14 years old is outlined in the report of Dr. Herman Schneider, dean of the College of Engineering of the University of Cincinnati. The New York City Board of Estimate's Committee on School Inquiry employed Dr. Schneider as one of 11 educational authorities to investigate the local public school system, under the supervision of Prof. Paul H. Hanus, of Harvard University. Dr. Schneider was chosen to report on vocational or industrial schools.

Dr. Schneider says that the schools fail to duplicate the work of the shops, but that the two may be made to co-operate to their mutual advantage. He favors the establishment of a compulsory continuation school law making it incumbent on employers of children of school age to send the children to school for not less than four hours a week in the daytime whenever the public school system establishes such schools. He outlines plans for the establishment of school courses by co-operation of shop employers and the constituted school authorities.

Various co-operative plans, such as those employed at Fitchburg, Mass., Solvay, N. Y., and Lewis Institute, Chicago, are cited in the report as having demonstrated by actual experiment that the co-operative scheme is commercially profitable to the manufacturer and to the student, and economical for the school.

"Under the continuation system," says Dr. Schneider, "the employer releases his employees of school age for a period of time (e. g. one-half day or a whole day) per week to attend the public schools for definite mental instruction. The instruction given at the school is entirely under the control of the school authorities, but the school authorities have no control whatever over the shop work. This type of school is in extensive operation in Germany, and a few have been started in this country. It has been shown in America by actual experiment (in Cincinnati) that a worker in the energizing trades who goes to school for one-half day per week on pay is a better producer per week than if he does not go."

Dr. Schneider blames the authorities for not being alive to the needs and necessities of the great mass of working people. Heretofore, he says, educational efforts in industrial education have been directed almost exclusively to the more energizing trades, such as plumbing, woodworking, blacksmithing, and machine shop work, instead of the automatic or enervating trades.

"A public school system, however," says the report, "must have a comprehensive community efficiency as its objective, and from this viewpoint the machine-feeding occupations present the more serious problem. Hence they must have at least the same amount of attention as the energizing work. If all the elements which make a citizen a good civic unit for a self-governing community are considered as the special business of the schools, then the problem of the mentally and physically enervated worker is its major task."

The New York Central Iron Works Company, formerly located at Geneva, N. Y., and now at its new plant at Hagerstown, Md., held its annual meeting January 22, resulting in the election of directors as follows: M. P. Moller, owner of the Moller organ works and president of the Crawford automobile works; Samuel Emmert, hardware merchant; Thomas W. Pangborn, president and treasurer Thomas W. Pangborn Company; D. A. Stickell, of D. A. Stickell & Son, millers; O. D. McCardell, of McCardell Brothers, merchants, and John G. Ernst, secretary Hagerstown Furniture Company. The directors are all men of considerable means and all are located in Hagerstown. The officers elected are as follows: M. P. Moller, president; Thomas W. Pangborn, vice-president and general manager; C. E. Williams, treasurer, and M. T. Kelleher, secretary. One of the principal products made by this company is the Dunning heating boiler. In addition it builds a large line of special plate and tank work.

Book Reviews

Engineering Directory. Pages, 1552; 4 x 6 3/4 in. Published by the Crawford Publishing Company, 537 South Dearborn street, Chicago, Ill. Price, \$5.

The 1913, or twentieth, edition of the Engineering Directory, marks a great improvement over the previous ones. Many changes have been made, both in the names and addresses of firms manufacturing the various articles listed. As usual the book has been made of a handy size and will slip readily into the pigeonhole of a desk, and there is a complete cross index to the approximately 4000 classifications contained in the section devoted to the products of manufacturers. The general makeup of the book is the same as last year, containing lists of jobbers and dealers in supplies, tools and machinery in mill, steam, mining, heating and lighting lines in the United States; lists of plumbing, steam and gas fitting supply jobbers and of wholesale dealers in hardware and electrical supplies in the United States and Canada; a list of manufacturers' agents and of manufacturers of plumbing, heating, lighting, mill, steam and mine supplies in the United States; a list of railroad purchasing agents in the United States, Canada and Mexico; the leading architects of the United States, and a list of gas and waterworks companies and cement mills in the United States, together with an extensive list of trade associations and their officers. A set of thumb indices facilitates the finding of any particular section of the book.

Metal Statistics. Issued by the American Metal Market and Daily Iron and Steel Report, 81 Fulton street, New York. Cloth; pages, 255; size, 4 x 6 1/2 in. Price, 50c. per copy.

This is the sixth annual edition of a publication which has proved to be an exceedingly valuable work of reference for the iron, steel and metal trades. It gives production statistics and prices on Lake Superior ore, pig iron, steel, finished iron and steel, scrap, ferromanganese, coke, copper, tin, lead, spelter, aluminum and antimony, silver, etc. The tables have been rearranged and enlarged and a number of new tables are submitted for the first time. The compilation is highly creditable to the editors, B. E. V. Luty and C. S. J. Trench.

Arthur G. McKee, consulting and contracting engineer, Cleveland, Ohio, has taken a contract from the Detroit Iron & Steel Company, Detroit, Mich., for the construction of new stock bins and storage trestle in connection with its No. 1 furnace. The ore and limestone bins will be of the recently patented Baker suspension type. The steel construction, amounting to approximately 400 tons, has been sublet to the Lackawanna Bridge Company. Mention was made recently that Mr. McKee had contracted to reconstruct the blast furnace of the Standard Iron Company at Deseronto, Ontario, Canada. The work will include two cast-iron pipe stoves, with blast and gas mains and other auxiliary equipment, a new hearth jacket, bosh jacket, columns and complete new steel construction throughout below the mantle. A new top structure and furnace lining will also be provided.

The Toledo Machine & Tool Company, Toledo, Ohio, has placed the contract and broken the ground for another works addition of considerable extent. Last fall a building measuring 90 x 115 ft., three stories, was completed for pattern and other storage purposes to obtain the ground space required for this new enlargement. It is to be a continuation of the machine shop, with the present craneway running on through the entire length of the new addition, which will be 100 x 150 ft., three stories, thereby adding about 45,000 ft. of floor space. A new power plant and pattern shop will be erected immediately thereafter. Orders are now being placed for the additional equipment necessary.

At the annual meeting of stockholders of the William B. Pollock Company, Youngstown, Ohio, builder of heavy plate work, Porter Pollock was re-elected president; Charles W. McClure, vice-president and general manager, and William G. Wilson, secretary and treasurer. The company reports having had a very prosperous year. It has a number of large contracts on its books.

Franklin Institute Gold Medal Awards

The Franklin Institute, Philadelphia, acting through its committee on science and the arts, recently awarded the Elliott Cresson gold medal, the highest in the gift of the institute, to the following, in recognition of achievements as set forth with each name:

Charles Proteus Steinmetz, Schenectady, N. Y., successful application of analytical method to the solution of numerous problems of first practical importance in the field of electrical engineering.

Emile Berliner, Washington, D. C., important contributions to telephony and to the science and art of sound-reproduction.

Isham Randolph, Chicago, distinguished achievement in the field of civil engineering.

John William Strutt, Baron Rayleigh, P. C., J. P., D. C. L., LL. D., F. R. S., Hon. C. E., Sc. D., Witham, Essex, England, extended researches of signal importance in physical science.

Sir William Ramsay, K. C. B., LL. D., D. Sc., M. D., Ph. D., F. R. S., F. C. S., London, England, numerous discoveries of far-reaching importance in the science of chemistry.

Emil Fischer, Ph. D., M. D., D. Sc., F. R. S., Berlin, Germany, numerous contributions of fundamental importance to the science of organic and biological chemistry.

Spelter Production in 1912

The production of spelter in the United States in 1912 is placed at 338,806 net tons in a folder issued by C. E. Siebenthal of the United States Geological Survey. This compares with a production of 286,526 tons in 1911, thus showing an increase of 52,280 tons. The figures apply to primary spelter which is made directly from ore, secondary spelter being recovered from such sources as drosses, skimmings and old meta's. The production of secondary spelter in the United States in 1912 was about 53,300 net tons, against 43,735 tons in 1911. The folder gives the production of spelter in the world in 1912 as 1,063,121 net tons, against 978,695 tons in 1911, being an increase of 84,426 tons. Names and locations of producers of spelter are also given, with the number of retorts operated by each at the close of 1912 and a list of those now in course of building. It also includes price and production curves covering the years 1906 to 1912 inclusive.

The Gas Machinery Company, Citizens Building, Cleveland, Ohio, has increased its capital stock from \$50,000 to \$150,000 to provide funds for extending its business. It will put on the market a new coke oven, which it will add to its present line of gas plants, gas producers, etc. It has just completed an addition to its plant in Collinwood and may make further extensions during the year. Frederick Feiter, formerly assistant engineer of the H. Kopers Company, has recently become associated with this company. W. E. Hartman, consulting engineer, Chicago, is also now connected with it in a consulting capacity.

Announcement has been made by the roads interested that the Chicago, Burlington & Quincy, Chicago & Eastern Illinois, Big Four, Illinois Central and Nashville, Chattanooga & St. Louis have completed their plans for the immediate construction of a double track bridge across the Ohio River between Metropolis, Ill., and Paducah, Ky. The bridge will cost \$4,500,000 and the terminals, yards, shops and other construction \$2,500,000 more.

The Ludlow-Saylor Wire Company, St. Louis, has elected Guilford Duncan, president; Frank Low and E. J. Gould, vice-presidents; D. I. Meier, secretary and treasurer; William Duncan, chairman of the advisory board. The directors are William Duncan, C. L. Dean, H. M. Meier, Guilford Duncan, Frank Low, Leslie Dana and E. J. Gould.

The strike of miners at the Richard iron mines in New Jersey has been settled, both sides making concessions. The men are again at work.

New Tools and Appliances

This is essentially a news department for which information is invited

Radial Ball Bearing.—A radial ball bearing in which a separator of unusual design is employed has been added to the line of F. & S. bearings handled by the J. S. Bretz Company, 250 West Fifty-fourth street, New York City. The separator is formed from a one-piece sheet steel stamping which is corrugated on one side and its use is said to overcome the effect of heating up and also permits very high speeds and vibration. Another advantage of the separator is the use of normally grooved raceways of deep cross-section. The raceway on the inner race has a slightly smaller radius of curvature than the outer one, which incloses more of the balls. The transverse side entrance used in the bearing is designed to enable the use of larger balls and in some sizes a greater number.

Precision Drawing Instrument.—Joseph W. Bramwell, 4931 Rubicam avenue, Philadelphia, Pa., has recently brought out a precision instrument for the accurate and rapid drawing of horizontal, vertical and inclined lines and accurate sectional lining. This instrument can be locked so that both of the operators' hands are left free and the blade extends across the board so that practically the entire surface may be used. A scale on the carriage provides for the setting of the blade at any desired angle with the edge of the board.

Tool Post Turret.—Carson & Hartwig, 25 Hackett street, Newark, N. J., have recently developed a tool post turret. To align the turret with the centers of the lathe to which it is applied, a vertical adjustment of 1 in. is secured by a threaded vertical sleeve surrounding the holding-down bolt. The turret is 5 in. in diameter and has six holes for round shank tools, such as box tools, counterbores, drills, taps, etc., as well as provision for holding six 5/16-in. square turning tools. A lever at the rear rotates the turret in one direction only and a spring-controlled index pawl locates the turret in its six positions.

Lathe Chip Guard.—The Barcy-Nicholson Company, Detroit, Mich., has designed a universal chip guard for use on the heavier classes of lathe work. The guard which was made for use in the plant of the American Steel & Wire Company, is 4 in. wide and 5½ in. high. There is a heavy glass window measuring 2 x 2½ in., which is slipped in from the top of the guard and is held in place by a 3/16-in. rod. The guard frame is 3/32 in. in thickness and has a slit which permits it to slip over the tool holder and drop down flush with the tool post ring. A clamp which is adjustable to fit different sizes of tool post and two rods hold the guard to the tool post.

Cutter Grinding Machine.—For handling cutters ranging from 4½ to 36 in. diameter and with from ⅛ to 4 in. face, the Ingersoll Milling Machine Company, Rockford, Ill., has developed a cutter grinding machine. With this machine it is possible to grind the face, the side and the corner of any milling cutter at one setting and the corner of the cutter may be either round or angular. The operator can reach all the controlling attachments from his position easily and all the adjustments are graduated to thousandths of an inch. The machine was designed with particular reference to wet grinding and the sides of the base are high enough to prevent the cutting fluid from splashing. When the machine is to be used for wet work an oil pump is furnished. Either belt or motor drive can be used and with the latter a 1-hp. motor is mounted on a bedplate fastened to the base of the grinding machine.

A New Metal Alloy.—High tensile strength, ductility and complete resistance to corrosion are claimed by Edgar T. Ward & Sons, Boston, Mass., for a new tin-copper alloy. This alloy, which has just been placed on the market, has been subjected to a number of tests that have shown it to be thoroughly malleable and capable of being drawn or rolled into all forms readily.

Goggles.—For the use of chippers, grinders, handlers of molten iron, babbitt metal, etc., and those doing welding and cutting by either the electric arc or the oxy-acetylene process, the American Spectacle Company, Inc., 27 West Twenty-third street, New York City, has brought out three new types of eye protectors or goggles. In the simplest form, the spectacles have large, plain glasses and are suitable for use when grinding is being done, but they do not afford protection at the sides against particles floating through the air. Another style having gauze

shields at the sides and a velvet packing strip which extends all around and prevents the entrance of dust at all points is also made. A third form is a pair of aluminum automobile goggles having removable glasses. Wherever these come in contact with skin, they are padded to exclude dust, etc.

Reference Disk Set.—The J. T. Slocomb Company, Providence, R. I., is placing on the market a set of reference disks, containing one disk of each of the following sizes: ¼, ½, 9/16, ¾ and 1 in., for testing a 1-in. micrometer. With this set of disks, it is possible to test a 1-in. micrometer at five points of the travel in the screw and also to test the anvil and screw at 9/16 in. to see if the faces are parallel and perpendicular to the axis of thread on the screw. The whole set is mounted in a small morocco covered case, which can be readily slipped into the pocket if desired.

Four-Spindle Drilling Machine.—A four-spindle drilling machine of the double-cam feed type has been recently brought out by the Moline Tool Company, Moline, Ill. All of these spindles are on one drive and any desired style and number of drilling heads can be furnished, while the tables and feeds are entirely independent. The cams can be readily changed to suit the requirements of any particular piece of work being handled and for the purpose of momentarily relieving the drills, breaking chips and admitting lubricant when steel is being cut the periphery of the cam is notched.

Metal Tool Case.—The Peck-Hamre Mfg. Company, Berlin, Mass., has placed on the market an all-metal tool case. The case which is of compact design and is intended to resist hard usage is finished in black japan and can be closed and locked easily. The drawers are lined with felt and shoulder straps are provided for convenience in carrying. The over-all dimensions are 16¼ in. long, 8½ in. high and 9¼ in. deep.

Shafting Hanger with Ball Bearings.—For use with its annular type, self-aligning, spherical race ball bearing, the New Departure Mfg. Company, Bristol, Conn., has brought out a new type of ball bearing shaft hanger. Box section gray-iron castings which are closed at the ends by a cap after the shaft is in place are used for the frames. The foot pads for the hanger frame are wide and have three slots, so that it is possible to support the hanger by a single bolt in each center slot or by lagscrews in the outside ones, where the service is exceptionally heavy. A machined retainer ring which is supported in the hanger frame by four set screws carries the bearings. The set screws are mounted in slots to permit both vertical and horizontal adjustment of the shaft and the hanger is made in both the ceiling and post types.

Three-Jaw Clamps.—For firmly gripping irregularly shaped pieces, W. A. Haskell & Co., South Braintree, Mass., have designed a three-jaw steel clamp. The two outer jaws, which operate on the toggle principle, have universal adjustment and if it is desired to use the device as a two-jaw clamp, the middle sliding jaw can be removed. The opening and closing of the clamp is controlled by turning the handle.

James B. Ladd, engineer, Mutual Life Building, Philadelphia, Pa., has taken over the business of Ladd & Baker, Inc., engineers. David Baker retires from the corporation to take up the duties of constructing engineer and general manager of the new iron and steel plant of the Broken Hill Proprietary Company, Ltd., New Castle, New South Wales, to which country he is now en route. Plans for the new plant were made by Ladd & Baker, Inc., and were announced in *The Iron Age* February 20. Mr. Ladd will serve as the consulting engineer for the company and will prepare specifications for the equipment, which, it is expected, will be largely bought in this country. The matter of purchasing the necessary equipment will probably be taken up early in April.

The Bucyrus Company, South Milwaukee, Wis., has filed notice electing to come within the provisions of the Wisconsin workmen's compensation or industrial insurance act. It lists 1654 regular employees. The company is one of the largest employers in the State to come within the act, which has now been accepted by 670 concerns employing 83,000 persons.

The Machinery Markets

The general tenor of reports from machinery manufacturing and distributing centers is that while there is here and there activity in some special lines which is of sufficient importance to excite comment the trade generally continues largely dependent on the influx of small orders from many sources. In some cities a falling off in both sales and inquiries is noticeable, but the volume of trade is still fair. The American Locomotive Company has been in the market for a large amount of shop equipment, a good part of which is of heavy or special design and will run into large figures. There have been two or three good deals in New York, but a quieter tendency is shown in the general run of business. Philadelphia has had a continuance of the good run of small orders. While many New England manufacturers are busy and the average production is heavy new demand lacks steadiness. The Cleveland demand for small lots is holding up well and the call for castings is heavy, although inquiries are less in number. Cincinnati is receiving scattered orders from the automobile trade and gas engine builders and woodworking machinery makers are busy. Fair activity continues in Detroit. The Chicago trade, which has been busy since the first of the year, reports a lull this last week. Milwaukee has had an improved demand for machine tools with inquiries more numerous. St. Louis also reports increasing activity both in sales and inquiries. On the Pacific coast general contractors' equipment has been moving excellently, while orders for machine tools have been small individually and railroad buying is uncertain. Both in the Central South and Birmingham business has been good for machinery and equipment.

New York

NEW YORK, February 26, 1913.

Some exceptionally large business has been practically placed in the last week by the American Locomotive Company for general locomotive shop equipment which will be distributed among various shops of the company, including Montreal, Richmond, Paterson and Dunkirk. The business is supplemental to some previous buying by the company, all of which has been made necessary by orders which have been piling up for locomotives. No complete list was issued for these tools, inquiries having been sent to the trade singly. Many of the requirements were of heavy or special machine tools on which comparatively few of the trade could bid, while others were for hydraulic presses and equipment outside the meaning of machine tools, as the trade understands the term. Action on the estimates submitted was considered at a conference held at the company's office February 24. The total value of the machines required was considerably over \$250,000. A few good sales have been made of recent date by New York machine tool representatives, but these were not widely distributed and trade generally has been a little quieter and almost entirely sustained by purchases involving comparatively small amounts and with the demand from many sources. The Standard Roller Bearing Company, Philadelphia, Pa., has bought probably \$30,000 worth of tools, mostly turret lathes, which will be used in manufacturing parts for a wire wheel for automobiles. The wheels have been more commonly used in Europe than in America, but their advantages are so many it is believed that they will eventually meet with wide favor here. Another purchaser to the extent of several thousand dollars has been The Wolf Company, Chambersburg, Pa., maker of flour mill machinery, which has been in the market for general equipment. A few orders have been placed also by the New York Central Railroad. Despite these transactions the machine tool trade reports a little falling off in inquiries, which is attributed to a feeling of hesitancy in view of the several events and announcements of a political character that are soon to transpire.

J. B. Taylor and C. C. Burns of the Watertown Electric Light & Power Company, Watertown, N. Y., have plans in preparation for the establishment of an electric power plant on the Oswegatchie River near Edwards, N. Y. A large dam will be built at the foot of Cotton Rapids, giving a sufficient head for the development of 3000 hp.

The Board of Public Works, Sharon Springs, N. Y., C. M. Mallett, chairman, is having plans for a sewage disposal plant with a capacity of 350,000 gal. by M. Vrooman, consulting engineer, Gloversville, N. Y.

The flouring mill of L. E. Williams at Steamburg, N. Y., near Salamanca, was totally destroyed by fire February 18. It is expected the mill will be rebuilt and re-equipped at once.

The Sweet & Doyle Company of Schenectady, N. Y., has purchased and will equip the plant on Center street, Green Island, which was formerly occupied by the Federal Signal Company but has been unused for several years.

The American Fire Resisting Cement Company, Buffalo, N. Y., has been incorporated with a capital stock of \$10,000 and will build and equip a plant at Broadway

and the West Shore Railroad for the manufacture of fire resisting cement by a patented process. H. T. and A. D. Upson and H. W. Cleveland are the incorporators.

The General Railway Signal Company, Rochester, N. Y., will add a foundry building to its plant at Lincoln Park, Gates, a manufacturing suburb.

Yawman & Erbe, manufacturers of filing cabinets and office furniture, are receiving bids for an addition to their manufacturing plant at Gates, N. Y., near Rochester. The new building will be 84 x 360 ft., with wing 84 x 250 ft., three stories and basement, the estimated cost being \$200,000.

The Alberger Pump & Condenser Company, Newburgh, N. Y., is taking figures on an addition to its plant to be 53 x 165 ft., one and two stories.

The Augustine Rotary Engine Company, Buffalo, is having plans prepared for boiler house and testing plant and a one-story warehouse 56 x 81 ft. of reinforced concrete to be added to its plant at Elmwood avenue and the Erie Railroad.

W. W. Hawks, 118-120 Water street, Newburgh, N. Y., is completing plans for an addition 70 x 125 ft., two stories, to be made to his paper box factory.

The Hewitt Rubber Company, Buffalo, has plans in progress for extensive additions to its plant at Kensington avenue and the New York Central Railroad belt line, including one building 100 x 450 ft. and a new power plant of 400-hp. boiler capacity.

The George J. Michelson Furniture Company, Rochester, is receiving bids for a manufacturing plant 117 x 150 ft., three stories and basement, and a power house 58 x 70 ft., one story. The estimated cost is \$100,000.

New England

BOSTON, MASS., February 25, 1913.

The demand for manufactured products lacks steadiness. Some shops and factories are exceedingly busy and are complaining of their inability to produce goods in sufficient volume to supply their orders. On the other hand reports are heard of a falling off in business. The average of production is high, but weak spots indicate some degree of unsettled conditions. It is significant that most of the makers of small tools of all descriptions are pushing their works at maximum capacity, which suggests prosperous times with the mechanics as well as with the factories, large and small.

Reports gathered by manufacturers who are taking an active interest in the tariff situation indicate that the next Congress will not do anything radical, at any rate in regards to the equipment that enters into metal working establishments. The first reports from Washington as to machine tools threatened at least a drop from 30 to 15 per cent. ad valorem, which the trade holds to be altogether too great a change, in fact one which would give to foreign competitors an advantage altogether out of proportion to any possible compensating benefit. Later news removes much of this alarm.

The new works of the Mead-Morrison Mfg. Company, Old South Building, Boston, Mass., which were referred to last week, will be located at the corner of Orleans and Prescott street, East Boston. They will cover about five acres of land, and will consist of one-story buildings with sawtooth roof construction. They will be equipped with one 25-ton and four 10-ton electric traveling cranes. The company manu-

factory coal handling and hoisting machinery. The old plant at Main and First streets, Cambridge, was seriously damaged by fire recently.

The company states that it is now in the market for the following equipment:

- One splitting shearing machine, capacity 1-in. plate, any length and width.
- One punch, 34-in. throat, capacity 1 1/4-in. hole through 1-in. plate.
- One angle and channel rolls, capacity 6 x 6 x 1/2-in. angles.
- One 10-ft. plate planing machine.
- One power brake, about 10-ft., capacity 1/2-in. plate.
- Two 8-ft. arm radial drilling machines.
- One plate bending rolls 8 ft. between housings, capacity 1/2-in. plate.
- One quick acting punch, 18-in. throat, capacity 1/2-in. hole through 1/2-in. plate.
- One angle iron shear on turntable 6 x 6 x 1-in. angle iron, motor-driven, alternating current.
- One splitting shear, capacity 1/2-in. plate, any length and width.
- One bar stock cutting-off saw, motor-driven.
- One cutting-off and centering machine, 6-in. capacity, motor-driven.
- One pipe threading machine, capacity 1 to 6-in., motor-driven.
- One portable riveter, capacity about 25 x 25-in.
- One fuel oil portable heater.
- One rivet heating forge, air pressure.
- Two portable rivet heating forges, air pressure.
- Six long stroke riveting hammers for 1-in. rivets.
- Two light riveting hammers for 1/2-in. rivets.
- Twelve chipping and calking hammers.
- Two reversing air drills.
- One 1500-lb. single-frame steam hammer.
- One upsetting and bending machine, capacity 3-in. in diameter stock.
- One 9 x 24 x 27-in. furnace, back and front open.
- Two flange clamps.

The Federal Chain & Mfg. Company, Brightwood, Springfield, Mass., has established a factory for the manufacture of chrome vanadium and nickel steel traction grips for the solid tires used on commercial vehicles. Frederick Cormack is president of the company, M. H. Cormack treasurer, and Thomas E. Griffin factory manager.

The large five-story building of Braman, Dow & Co., Boston, plumbing and steam fitting supplies, on Causeway street, was practically destroyed by fire, February 20.

The plants of the Trumbull-Vanderpool Electric Company and the Flynn & Doyle Carriage Mfg. Company, Bantam, Conn., were burned, February 19.

The large plant of the Shay Fertilizer Company, Groton, Conn., which was destroyed recently, will be rebuilt.

The Waterbury Standard Tool & Machine Company, Inc., Waterbury, Conn., has been incorporated under a Connecticut charter, and will manufacture wire forming machines, special watch machinery, sub-press machines and die punch presses, jig-filers, etc., at 135 East Main street. The incorporators are Jeremiah W. Phelps, Thomas N. Prentice and Emil Hummel, all of Waterbury. The company states that its shop is equipped and no new machinery will be required for the present.

The New Haven Welding Company, New Haven, Conn., is occupying its new building at 67 Broadway, where it has increased equipment for welding and cutting all kinds of metals.

The C. J. Root Company, Bristol, Conn., manufacturer of automatic counters, wrought brass hinges, metal stampings, etc., has increased its authorized capital stock from \$50,000 to \$100,000. The business was incorporated in 1907, with \$32,000 of stock issued. Since that time a new factory has been erected and a complete polishing and plating plant established, and the lines of manufacture have been added to. Considerably more capital than that represented by issued stock has been used, and consequently a stock dividend of 100 per cent. has been declared, bringing the actual capital stock to \$64,000.

Philadelphia

PHILADELPHIA, PA., February 25, 1913.

The market continues irregular, but has inclinations toward greater activity. Several merchants report materially larger sales in the week, covering not only a better volume of single tool business but also a fair amount of business in small groups of tools. While there has been little offered in the way of new business from the railroads, one order, covering a long standing inquiry for a 36 in. planer, has been placed by the Pennsylvania Railroad. The general trend of inquiry, which has been principally confined to small tools, appears to be slightly more active, the demand covering very fairly the general line of machine tool equipment. Foundries have been more active buyers of general foundry equipment, particularly in the way of cupolas, a number of which are being figured on for replacement purposes. A fair amount of new business in power plant equipment is before the trade, in-

cluding some good-size office building equipment. Second-hand machinery and tools have been in comparatively good demand, particularly equipment of the more modern type. The volume of business moving in special machinery has been good and builders of such equipment are uniformly busy. The casting trade, both grey iron and steel, continues actively engaged.

The William F. Remppis Company, Reading, Pa., has purchased the Sheeder Planing Mill property, 100 x 500 ft., embracing a block, between Spruce, Pine, Mifflin streets and Biddle alley, in that city, which is to be remodeled so as to be adapted to the company's business, covering architectural and ornamental iron and steel work, as well as structural steel work. Additional buildings are to be erected and equipped. The Reading Standard Company, manufacturers of motor cycles, with which the above interests are identified, will hereafter occupy the entire old plant of the Remppis Company, on Water street above Bingaman street bridge, which will be improved by the addition of considerable machinery.

Herman Loeb, director of the Department of Supplies, City of Philadelphia, Room 312 City Hall, will receive bids until February 28 for the furnishing of two continuous electrical blue printing machines, for the Bureau of Surveys. Particulars may be obtained on application to the office of the director.

The Richmond Radiator Company is taking bids for the erection of a new foundry and machine shop, to be erected on a site recently acquired at Millnor and Devereaux streets. Plans are by George W. Graves, Detroit, Mich., and include a brick and concrete building 100 x 354 ft.

The Board of Chosen Freeholders of Cumberland county, New Jersey, has authorized the drawing of plans and specifications for a new and modern draw bridge, to span the Maurice river at Milville, N. J. A preliminary survey is to be made at an early date.

Proposals will be received and opened at the League Island Navy Yard, Philadelphia, March 5, for a quantity of naval supplies, including under schedule 5194, a quantity of pressure gauges, particulars regarding which may be obtained on application to the Navy Pay Office, Philadelphia, or to the department at Washington, D. C.

The Philadelphia Electric Company is taking bids, from plans by John T. Windrim, architect and engineer, for a one-story addition, 78 x 87 ft., to the power house at its Tacony station, in compliance with recently reported plans for extensions to its plant equipment.

The plant of the Main Belting Company, 1235-1241 Carpenter street, manufacturer of Leviathan belting, was damaged by fire February 20. While the fire did considerable damage the company will not be inconvenienced in making deliveries against orders, as it maintains stocks in its warehouses in various parts of the country. The work of repairing the fire damage has already been started.

H. L. Reinold, architect, is taking bids on the erection of a 10-story apartment house, 40 x 130 ft., to be built at 1327-1329 Spruce street for T. W. Barlow, which will include the installation of a steam heating and power plant and several elevators. Sub-bids on all lines are being taken.

The Baldwin Locomotive Works has recently received a number of smaller orders for locomotives. Recent reports include orders for twenty engines for the St. Louis and Southwestern Railroad. The various departments of the plant, including its local shops, Eddystone and Burnham plants, are being operated at full capacity and have sufficient work to keep them fully occupied for some months.

Chicago

CHICAGO, ILL., February 25, 1913.

Activity in the buying of machine tools, which has been consistently maintained at a very satisfactory rate since the first of the year, experienced a noticeable lull in the past week. With the exception of a single grinder, for which the Atchison, Topeka & Santa Fe Railroad is in the market, there are no additional railroad requirements current.

The Paltridge Metal Equipment Company, Chicago, has been organized with a capital stock of \$50,000 to manufacture metal building equipment and interior finish. The incorporators are R. W. Paltridge, 53 West Jackson Boulevard, Charles W. Denicke and Charles A. Stone.

The Goodman Mfg. Company, South Halsted, street, Chicago, builders of mining machinery, has taken out a permit providing for the erection of a two-story factory, 100 x 110 ft., to cost \$35,000.

The Armour Car Lines is adding to its yard and shop facilities at Meridian, Miss., erecting additional buildings and installing new machinery.

The Bess Mfg. Company, Kewanee, Ill., is completing plans for the addition of a number of new buildings to its plant this spring.

Deere & Co., Moline, Ill., are completing plans for the erection of four large additional factory buildings, including a foundry for gray iron castings, to be built at East Moline.

William Rehfuess, Peoria, Ill., has taken out a permit for the erection of a two-story brick factory, 43 x 50 ft., to cost \$7,000.

William A. Ohlhaber & Co., Aurora, Ill., are planning the erection of a \$50,000 factory in which several thousand dollars' worth of new machinery will be installed.

The factory of the Federal Plate Glass Company, Ottawa, Ill., recently destroyed by fire, will be rebuilt at once at an estimated cost of \$100,000.

F. S. Rosemeier and C. L. Folgate, Freeport, Ill., will open a machine shop April 1, fully equipped with new tools, for repair work of all kinds.

The Fort Dodge Sheet Iron & Metal Works, Fort Dodge, Iowa, has purchased a site and will begin the erection of a new shop at once.

The Chicago & Northwestern Railway has perfected plans for new repairs shops, to be located at Clinton, Iowa, and to cost in the neighborhood of \$500,000.

The Sanitary Food Mfg. Company, Minneapolis, Minn., in addition to the new factory already completed, contemplates the erection of seven additional buildings, to be of concrete, glass and steel construction.

The Hanson & Vick Company has obtained a site on Oneota street, Duluth, Minn., for a factory building to manufacture interior store fixtures.

The W. C. Hendrie Rubber Company of Denver, Col., has purchased a site and will erect a \$100,000 automobile tire factory in Torrence, a suburb of Los Angeles, Cal.

Detroit

DETROIT, MICH., February 25, 1913.

There have been no developments of unusual note in the local machine tool market the past week, but business continues on an even tenor. Dealers report a fair run of single tool orders, but large propositions are lacking. There are a fair number of inquiries before the trade but there seems to be nothing to indicate any great increase of activity in the immediate future. The fact that the automobile plants are doing very little buying is a large factor in this market. The demand for second hand machinery is light. Some demand for general mining machinery and power plant equipment is noted from the iron and copper mining districts in northern Michigan, where producers are preparing for a very active season. Building operations continue sluggish.

Alexander Dow, president Detroit Edison Company, has announced plans calling for extensive additions to the company's several plants in this city and to their equipment. The company has ordered a turbo-generator of 15,000 kw. capacity and will install a considerable amount of miscellaneous equipment. A tract of approximately 22 acres has also been purchased at the foot of Lyncaste avenue, as a site for the company's east side plant, which will be erected as soon as the increase of business warrants.

The Stroh Brewery Company, Detroit, has taken out a building permit covering the erection of an eight story steel and concrete brewery, 74 x 90 ft., at Elizabeth and Rivard streets. The new building will cost \$100,000, exclusive of equipment.

The Universal Wheel Company, Detroit, has been incorporated with a capital stock of \$250,000 to manufacture automobile and other wheels. Frederick Knopp, John J. Knight and Joseph P. Lavigne are named among the incorporators.

Albert Kahn, architect, Detroit, has awarded the general contract for the new buildings which are to be erected for the Industrial Works, Bay City, Mich., to Henry C. Weber.

Owing to its rapidly increasing business the Brown-wall Engine Company, Lansing, Mich., is contemplating the erection of a new plant. The company is a manufacturer of gas engines.

Warden Fuller, of the Ionia State Reformatory, Ionia, Mich., has asked for an appropriation of \$75,000, to be used in rebuilding the factory housing the Ypsilanti Reed Furniture Company at the prison, which was destroyed by fire recently. The estimate calls for

a three-story building, 75 x 380 ft., to be equipped with a sprinkler system, power elevators, etc.

The Board of Public Works, Battle Creek, Mich., will erect a new pumping station at Verona Wells, near that city. The building and its equipment will cost \$40,000.

At the annual meeting of the stockholders of the Port Huron Paper Company, Port Huron, Mich., it was decided to erect an additional paper mill of sufficient size to allow of the doubling of the company's present output.

The Board of Trade of Reed City, Mich., has completed negotiations with the Pittsburgh Wood Preserving Company, whereby the company will establish a large tie treating plant at that point.

The Davies-Putnam Furniture Company, Grand Rapids, Mich., has increased its capital stock from \$40,000 to \$50,000 to add to its mechanical equipment. The company will also enlarge its factory quarters.

The Atlas Drop Forge Company, Lansing, Mich., is having plans prepared for a new plant which will give the company double the capacity of its present factory. The new plant will be of fireproof construction and modernly equipped.

At the annual stockholders' meeting of the St. Johns Foundry Company, St. Johns, Mich., the capital stock was increased from \$10,000 to \$15,000, and it was decided to build a new furnishing room and machine shop, 30 x 100 ft. F. C. Mason is secretary and treasurer.

S. M. Carpp, Hartford, Mich., has acquired the plant and machinery of the Hartford Canning Company, and will remodel and enlarge the factory.

Samuel Young, St. Joseph, Mich., will establish a factory for the manufacture of pearl buttons in that city.

I. N. Conrad, owner of the Boyne City Iron Works, Boyne City, Mich., has disposed of his interest in the plant to Frank A. Altrock and Newton Conrad, who will continue the business on a more extensive basis.

George Smith, St. Charles, Mich., and others have completed plans for the establishment of a hoop factory at Arnheim, Mich. The plant will have a capacity of 100,000 hoops monthly.

The Cable-Nelson Piano Company, South Haven, Mich., is adding to its factory space by the remodeling of its stock building, which will be devoted to the manufacture of player pianos.

The Zeeland Ornamental Works, Grand Rapids, Mich., will rebuild its plant recently destroyed by fire.

The plant of the Lee-Porter Axle Company, Buchanan, Mich., recently completely destroyed by fire, causing a loss of \$75,000, is to be rebuilt at once.

Milwaukee

MILWAUKEE, WIS., February 24, 1913.

There is an improvement in the demand for machine tools and heavy machinery of all kinds, and the number of inquiries coming in to Milwaukee manufacturers indicates that the spring months should show a marked advance compared with the present season. While there is nothing extraordinary in the way of large contracts to report, the feeling in the trade, due to the business in hand and ready for production, is most promising. A year ago the volume of business was not nearly so large, yet at that time the conservative manufacturers felt not unlike they do now. One of the largest industries in the Milwaukee district, the A. O. Smith Company, has been working under the handicap of the most serious labor trouble in its history for several days, but this strike will have a speedy end. With the sale of the remaining assets of the Allis-Chalmers Company on February 27, the prospects are for a rehabilitation of the big concern without delay. While its production has not felt the effects of the receivership appreciably, the influence of litigation has had something of an effect on its business, which was readily overcome. When the most important of Milwaukee's industries is back on a firm basis, all of the industries of the district will, it is expected, find material improvement.

A new automobile factory seems to be assured for Wisconsin by the organization with \$1,000,000 capital stock of the Hoff Motor Company, La Crosse, Wis., now under way under the direction of Anoust and Joseph A. Hofweber of La Crosse. A factory will not be established until the company has determined the success or failure of the proposed product by the test of 20 of the cars, which are to be constructed at Detroit immediately upon the permanent organization of the company.

C. E. Blake of Prairie du Sac, Wis., has organized

the Prairie du Sac Light & Milling Company, with a capital stock of \$25,000. The company will develop the Blake water power on the Wisconsin River at Prairie du Sac and convert the power, now used for flour milling purposes, into current for light and power for industries and residents. John B. Sanborn of Madison and Anne Fitzgerald of Prairie du Sac are associated with Mr. Blake.

The Eden Electric Light Company, Eden, Fond du Lac County, Wis., has been incorporated by John and K. L. O'Brien and Frank Sieloff, to establish, maintain and operate an electric light and power plant.

Hanley Bros., commission merchants, Racine, Wis., with branches at Kenosha, Wis., and Chicago are having plans prepared for a \$25,000 refrigerating plant and cold storage warehouse, to be constructed on North Erie street, Racine.

Nicholas Rummel, owner of the Rummel machine shop and foundry at Kewaskum, Wis., is building an addition to serve as a garage. He will operate a repair shop in the present quarters and handle automobiles.

The Fairbanks-Morse Mfg. Company, which some time ago announced that it intended to make important additions to its Eclipse works at Beloit, Wis., has taken options on a tract of approximately 10 acres adjoining its present large works and proposes to use the site for the additions. Plans are being made at the home office in Chicago.

The Feilbach Motor Company, 1144 Holton street, Milwaukee, Wis., has purchased a site of five and one-quarter acres upon which a new plant will be erected.

The Concrete Roof Tile Machinery Company, Madison, Wis., has petitioned for a charter with a capital stock of \$50,000, the incorporators being I. A. Cole, C. N. Robbins and C. E. Mullen.

The Shoe Dealers' Machine Company, Berlin, Wis., has been incorporated with a capital stock of \$30,000 by B. E. Scott, F. M. Huson, T. W. Hamilton and W. H. Wyman.

Hofweiber Brothers, La Crosse, Wis., have interested capital and completed plans for the erection of a factory for automobile building in that city.

The Sailer-Whitemore Machine Company, Neenah, Wis., has secured the contract for repairing all of the government boats at that location during the coming season of navigation.

The Waverly Mfg. Company, Jefferson, Wis., is preparing plans for the erection this spring of a three-story machine shop addition to its present plant. New equipment will be required.

Arrangements have been made for the erection of a new power plant at New Richmond, Wis.

Cleveland

CLEVELAND, OHIO, February 25, 1913.

The demand for small lots of machine tools is holding up well. The largest order reported placed in the local market in the week was for about 20 machines, aggregating \$12,000. While sales are satisfactory new inquiries in the past few days have not been as numerous as in the previous few weeks. Dealers, however, look for no falling off in the scattered buying in small lots that has been going on for some time. Manufacturers in metal working lines are very busy and there are no reports of a falling off in the volume of orders. In the jobbing foundry trade the demand for castings is heavy, and local plants have all the work they can do.

The Cleveland Machine Knife Company, Cleveland, is having plans prepared for a new plant to be erected at Fry avenue and the Nickel Plate Railroad, Lakewood. The new structure will be about 60 x 200 ft., mostly one story. The forging room will be two stories. Some new hammers and other equipment will be installed. It is planned to start work on the plant about March 1 and have it completed in July. E. E. Brown is president of the company and E. G. Hollman is secretary.

The Vulcan Mfg. Company, Painesville, Ohio, which was recently formed with a capital stock of \$200,000 to build automobiles, has purchased a small amount of machine tool equipment, and is expected to buy considerable additional machinery from time to time. The officers are F. H. Murray, president; E. G. Ewell, vice-president; E. D. Hartwell, secretary and treasurer, and A. R. Marsh, general manager. The company recently acquired the Horton plant in Painesville.

The De Vilbiss Mfg. Company, Toledo, Ohio, has had plans prepared for a new plant which will be built on a new site on Detroit avenue. A four-story building of steel and concrete will be erected. The company manufactures mechanical spraying devices.

The Mather Spring Company, Toledo, Ohio, has increased its capital stock from \$100,000 to \$300,000. It is stated that the plant will be enlarged and additional equipment installed.

The Swinehart Tire & Rubber Company, Akron, Ohio, will enlarge its plant by the erection of a concrete building, 70 x 102 ft., three stories.

The Federal Carbon Company, Lorain, Ohio, has been incorporated with a capital stock of \$1,000,000 to manufacture and refine carbon, carbonized products and by products.

Plans for a mechanical filtration plant in Steubenville, Ohio, are being prepared by Chester & Fleming, engineers, Pittsburgh. Bonds in the sum of \$200,000 will be sold April 15 to provide funds for the plant.

The City Council of Barberton, Ohio, has secured estimates of cost with the view of building a municipal lighting plant.

The Ohio Electric Car Company, Toledo, Ohio, has increased its capital stock from \$250,000 to \$500,000.

The New Wonder Company, Washington C. H., Ohio, has been incorporated with a capital stock of \$85,000 to manufacture and deal in stoves. The incorporators are E. L. Bush, C. A. Reid, Frank H. Kennedy, W. B. Rogers and J. M. Willis.

The Regle Brass Company, recently organized, of Marysville, Ohio, has placed its plant in operation. J. B. Couture is general manager.

At the recent annual meeting of the National Sanitary Mfg. Company, Salem, Ohio, F. C. Borden, I. G. Dimond, S. Grove, Jr., J. S. Jobe, S. J. Shanabrough and Frank C. Moff were elected as board of directors. A bond issue of \$125,000 was authorized for plant extensions. The officers reported a very satisfactory volume of business in the past year and a bright outlook for 1913.

The Maxwell Mfg. Company, Cleveland, has been organized with a capital stock of \$25,000 to manufacture envelope seals and other products. Among the incorporators are John R. Garfield and Grover Higgins.

Indianapolis

INDIANAPOLIS, IND., February 25, 1913.

The Indianapolis Parcel Post Scale Mfg. Company, Indianapolis, has been incorporated with \$25,000 capital stock to manufacture scales and novelties. The directors are George W. Miller, Clair M. Crawford and Watts A. Schafer.

The George Loring Company, Indianapolis, has been incorporated with \$10,000 capital stock, to manufacture electrical machinery. The directors are George Loring, R. S. and G. S. Howell, and Charles M. Reagan.

The Indianapolis Cable Elevator Company, Indianapolis, has been incorporated with \$10,000 capital stock to manufacture cable elevators and other machinery. The directors are Claude E. Negley, Mathew C. Mayhew and John Kingsbury.

The T. M. S. Mfg. Company, Indianapolis, has been incorporated with \$25,000 capital stock, to manufacture self-propelled vehicles. The directors are L. W. Mellette, F. M. Strong and W. J. Gemmell.

The Perfection Septic Tank Company, Indianapolis, has been incorporated with \$25,000 capital stock, to manufacture septic tanks. The directors are Charles F. Surface, Arthur A. McKain and A. Dayton Rinker.

The Lawrence Heat Distributor Company, Indianapolis, has been incorporated with \$5,000 capital stock, to do a foundry and heating appliance business. The directors are William E. Springer, June L. Blanchard and Margaret A. Blanchard.

Fred Ropkey has been appointed receiver for the Roth-Murphy Machine Company, Indianapolis, manufacturer of engine starters. Its assets consist of patent rights.

The Montpelier Utilities Company, Montpelier, Ind., has been incorporated with \$50,000 capital stock to supply Montpelier and nearby communities with heat, light and power. The directors are John P. Boyd, Guy R. Bracken and Rowland M. Sidney.

The Wayne Oil Tank & Pump Company, Ft. Wayne, Ind., has increased its capital stock from \$200,000 to \$250,000.

The Automatic Trowel & Tool Company, Dugger, Ind., has been incorporated with \$10,000 capital stock, to manufacture plasterers' tools. The directors are N. W. Ringo, Charles Mason and A. Ringo.

The Hammond Machine & Forge Works, Hammond, Ind., has been incorporated with \$25,000 capital stock to operate a forge and machine plant. The directors are Daniel, Edwin and Selma Bruhn.

The Michigan City Paper Box Company, Michigan

City, Ind., has been incorporated with \$15,000 capital stock, to manufacture paper boxes and other products. The directors are Albert S. Hoodwin, James P. Kenefick and A. Hallman.

The Crawfordsville Furniture & Lumber Company, Crawfordsville, Ind., has been organized with \$75,000 capital stock, to manufacture furniture. The directors are E. A. Sterzik, H. E. Greene, P. O. Rudy, Howard Smith and F. C. Evans.

David I. Smith, Elkhart, Ind., is planning the erection of an artificial stone manufacturing plant, 40x50 ft., on Charles and Princeton streets.

The Pierce Speed Controller Company, Anderson, Ind., has been incorporated with a capital stock of \$25,000 to manufacture speed indicating and controlling devices. Incorporators are George W. Pierce, F. E. Mustard and U. M. McCullough.

The Huntington Machine & Foundry Company, Huntington, Ind., recently incorporated, has disposed of stock sufficient to make the building of a machine shop and foundry possible, and this construction will be undertaken at once to be completed by August 1. C. F. Heinss is president.

The National Automatic Tool Company, Richmond, Ind., has been organized with a capital stock of \$150,000 to manufacture metal products. The incorporators are W. F. Bockhoff, L. F. Bockhoff and J. C. Bockhoff.

The Lawter Tractor Company, Newcastle, Ind., has been incorporated by B. H. Lawter, O. P. Carpenter and J. C. Goodwin, to manufacture and sell farm machinery.

Cincinnati

CINCINNATI, OHIO, February 25, 1913.

While there are a number of unclosed railroad lists out, buying against them is slow. Some scattered orders for machine tools are coming in from the automobile trade. The export business is only moderately good. Gas engine manufacturers continue very busy, and there is an excellent demand for all kinds of wood-working machinery. The jobbing foundries are getting about as much business as they can conveniently handle.

The Ideal Steel Wheel Company, Winton place, Cincinnati, whose plans were mentioned some time ago, is purchasing tools and machinery to finish fitting up its new plant.

The Heer Engine Company, Portsmouth, Ohio, is having plans prepared for an addition to its plant that will be 80 x 160 ft., one story, for which additional machinery equipment will be required.

The Jacob Leukart Company, Columbus, Ohio, recently incorporated with \$30,000 capital stock, is buying equipment for its new plant on East Columbus street. The company will manufacture special wood-working machinery.

The National Ice & Cold Storage Company, Columbus, Ohio, will build a large ice plant in that city. G. R. Bassett, Columbus, is preparing the plans.

On February 20 fire destroyed a large amount of valuable machinery in the Cincinnati repair shops of the Cleveland, Cincinnati, Chicago & St. Louis Railroad that will have to be replaced.

The C. W. Raymond Company, Dayton, Ohio, manufacturer of brick making machinery, has let contract for an extensive addition to its plant on Bolender avenue. Nothing is known as to the machinery requirements.

It is rumored that the Corbin Screw Corporation, whose headquarters are at New Britain, Conn., contemplates making a large addition to its branch plant at Dayton, Ohio.

The Baldner Automobile Mfg. Company, Xenia, Ohio, recently organized, contemplates the erection of an automobile plant at that point. Jacob Baldner is general manager of the new firm.

The National Marking Machine Company, Cincinnati, has secured more commodious quarters on Gilbert avenue. Very little new equipment will be required.

The Hobart Electric Company, Troy, Ohio, has acquired a four-story building adjoining its plant, that will be fitted up for manufacturing purposes.

The Cincinnati Electrical Tool Company, Cincinnati, is one of the latest additions to the membership of the Cincinnati Branch, National Metal Trades Association.

Secretary Dickson, of the Cincinnati Branch, National Metal Trades Association, announces that the annual meeting and banquet of the association will be held at the Business Men's Club on the evening of March 6. A full list of speakers has not yet been made up.

St. Louis

ST. LOUIS, Mo., Feb. 24, 1912.

The machine tool market continues to show increasing activity and the dealers are receiving more inquiries than for a considerable period. Interest is now centered on the closing of the contract for the equipment of the new Decatur shops of the Wabash, which, however, will probably be split among a number of concerns. With the final decision of this large order a considerable amount of anxiety will be relieved, as the recent slow business made the competition very keen.

An expenditure of \$30,000 for changes in equipment of the main station of the Union Electric Light & Power Company, St. Louis, has been authorized by the directorate to prepare for handling the hydro-electric power to be delivered to the company in the coming year.

The National Camera Company, St. Louis, has been incorporated with \$20,000 capital stock to equip a plant for the manufacture of cameras and camera supplies. The incorporators are C. J. Shea, C. R. Dudley and Joseph R. Bettis, the latter of Webster Groves, Mo.

The Benton Stone & Crusher Company, Springfield, Mo., with \$6,000 capital stock, has been incorporated by George and H. J. Schurer and John Brandon, Sidney Bacon and W. R. Boyd, and will equip a stone-crushing plant.

The Arrowhead Mfg. Company, St. Louis, has been incorporated by John F. Renick, Julius Collins and August F. Schuerman to do a general manufacturing business.

The East St. Louis Bridge Company, East St. Louis, Ill., has increased its capital stock from \$125,000 to \$175,000 for the purpose of increasing its equipment.

The Ford Motor Company, Detroit, has completed its plans for a five-story assembling plant in St. Louis to cost, exclusive of ground and machinery, \$200,000. It will be equipped to assemble automobiles.

The Williams Patent Crusher & Pulverizer Company, St. Louis, has bought ground near its plant for the purpose of increasing its manufacturing facilities.

The Valler & Spies Milling Company, St. Louis, has taken out a permit for the construction of a seven-story mill building, for which the mill equipment is to be ordered later.

The East Side Coal & Mining Company has been formed by the Clark Bros. syndicate, of Philadelphia, and will erect a large power house near Alton, Ill., and will build a line to mining property owned by the syndicate and which the syndicate will work when transportation facilities are provided.

The St. Louis Independent Packing Company has begun work on a large addition to its packing and cold storage facilities. No announcement has been made as to the equipment required.

The LeRoy Creamery Company, LeRoy, Ill., has been incorporated with \$6,000 capital stock by G. Grant Smith, J. A. Taylor and L. C. Keenan and will equip a creamery plant at once.

The Fort Smith Wagon Company, Camden, Ark., will establish a manufacturing plant at Waldo, Ark.

The Arkansas Valley Cotton Oil Company's plant at Dardanelle, Ark., was burned recently with a loss of \$50,000. The plant will be replaced it is announced.

The Bernston Steel Wheel Company, Bethlehem, Pa., represented by J. North Carnahan, of Washington, D. C., has plans, it is stated, for the construction of a branch plant at Kansas City, Mo., to manufacture a patented steel wheel.

The Wyandotte Tripoli Company, Miami, Okla., has been incorporated with \$100,000 capital stock by J. P. McNaughton, E. D. Ballard, H. J. Swats and others and will equip to mine and manufacture the products of a tripoli deposit controlled by them.

The Ilmo Sheet Metal & Mfg. Company, East St. Louis, Ill., has been organized by A. S. Atkins, F. F. Mertz and M. J. Klee with a capital of \$2,500 to engage in a general sheet metal business.

The Pitzele Stove Company, Corning, Ark., with \$15,000 capital stock, has been incorporated to manufacture stoves. The incorporators are M. A. Isaacs, S. E. Spikes and S. Riegler.

Alexander Dussell & Co., of New Orleans, La., has plans for the enlargement of their manufacturing plant and the addition of considerable machinery, doubling capacity.

The Johnson Iron Works, Ltd., of New Orleans, La., will build a plant in the spring, but the details are not available at present.

The Hannibal Car Wheel & Foundry Company, Hannibal, Mo., with \$100,000 capital stock, has been incorporated by A. R. Smith, D. D. Mahan, W. J. Dakin

and others and will acquire and enlarge the plant of the A. Treat Mfg. Company.

The Century Electric Company, St. Louis, which is building a large addition to its plant has not yet set a date for bids on the metal working equipment required.

Dredging equipment for the development of about 20,000 acres of oil land will be required by M. M. Valerius, T. E. Farr and Frank Engles, all of Sapulpa, Okla., who have acquired oil property at Alma, Okla.

A gas manufacturing plant is to be built and equipped at Laurel, Miss., by John T. Bacon, of Cincinnati, O., and others, who have secured a franchise for public service.

The Regina Oil Company, Bartlesville, Okla., with \$200,000 capital stock, has been incorporated by A. E. Duran, Paul E. Johnson and B. L. Love and will develop oil property controlled by them.

The Home Oil & Gas Company, Chickasha, Okla., with \$150,000 capital stock, has been incorporated by H. B. Johnson, Isaac Harness, J. C. Gool, T. H. Dwyer and others, who have property which they will develop.

E. W. Kimbley and H. L. Allen, of Okmulgee, Okla., and O. L. Scully, of St. Louis, Mo., have incorporated the Kimbley Oil Company, to equip and develop oil property controlled by them.

The Chinowa Oil Company, with \$500,000 capital stock, has been incorporated at Tulsa, Okla., by Robert Jordan, J. F. McCoy and D. M. Powers to operate oil property controlled by them.

The City of Richmond, Mo., has completed plans for the installation of a two-compartment septic tank and allied equipment for the handling of city sewage.

The plant of Waterworks District No. 1 at Fort Smith, Ark., is to be enlarged under the direction of H. E. Kelley, chairman of the board of public improvements.

The waterworks plant improvements planned by the city of Tutwiler, Miss., includes a considerable amount of new equipment.

The city of Armstrong, Okla., will vote March 18 on a bond issue for the construction of a municipal waterworks plant.

The Oklahoma Power Company, with Lake Moore and B. O. Sims of Weleetka, John Smith of Henryetta, and W. D. Ford of Muskogee, Okla., has plans for a hydro-electric plant on the Canadian River to develop 8000 hp. It will also build an auxiliary steam plant.

The St. Louis Cordage Mills, St. Louis, a branch of the American Mfg. Co., has taken out permits for the erection of two warehouses and a factory to cost \$50,000.

The Fred Medart Mfg. Company, St. Louis, has taken out a permit for a two-story factory to be erected at 3521 De Kalb street. The building will be 48 x 125 ft., of reinforced concrete construction and will cost \$12,000.

The St. Louis Independent Packing Co., St. Louis, is to erect a large cold storage plant, 112 x 172 ft., on Chouteau avenue, at a cost of \$150,000.

The Griffith Shingle Company, Paragould, Ark., is contemplating the erection of a new factory.

The Washington Iron Works Company, Sherman, Texas, has had plans prepared for the erection of a plant at Sherman, comprising a main building 40 x 112 ft. and forge shop 40 x 32 ft., the main building to contain a machine shop and garage.

The Central South

LOUISVILLE, KY., February 25, 1913.

The demand for machinery is brisk. Business seems to be opening up in earnest, and both inquiries and sales are much more numerous than they have been since the opening of the year. There is a good call for practically all lines, power and conveying equipment being probably the leaders, but woodworking equipment and machinery tools are also in good demand. The weather of late has been mild and open, and construction work is going ahead, making it possible for machinery used in building and in equipping structures of various kinds to be ordered. Public service corporations are showing interest in new machinery, and calls from companies all over the Central South are being received. The situation generally is extremely satisfactory and the outlook is excellent.

The American Cresosoting Company, Louisville, has placed orders for 15 pumps for which it has been in the market. Several motors, to be used in connection with some of the pumps, are still to be bought. The company purchased its elevating and conveying

machinery from E. D. Morton & Co., Louisville dealers, who will furnish Webster conveyers.

J. B. Speed & Co., Louisville, have purchased a 16-in. belt conveyor from the Robbins Conveying Belt Company. This firm has also started work on the construction of a new cooper shop at Sixteenth and High streets. It replaces another shop in a different location. Motors and barrel-making machinery will be purchased.

E. D. Morton & Co., Louisville, have the agency for the Eames line of compound mandrel presses. They are made in Kalamazoo, Mich.

The Louisville agency of the Dean Steam Pump Company, Holyoke, Mass., reports the sale of one 200 gal. per min. and one 300 gal. per min. steam pump to Shelbyville, Tenn., for installation in its waterworks plant.

Webster Gazlay, National Concrete Construction Company, Louisville, who is the designing engineer for the new power plant of the Seelbach Hotel Company, Louisville, announces that plans and specifications for the building and machinery will be ready about March 1. The only machinery ordered thus far is a motor-driven pump from the Dean Steam Pump Company.

The Wood & Turner Company, Louisville, has been incorporated with \$2,000 capital stock for the purpose of manufacturing grain handling and flour milling equipment. Transmission and conveying machinery will be the principal lines. The company has established a shop at 823-825 South Fifteenth street, the building being 80 x 166 ft. Most of the equipment, including planers, lathes, drill presses, saws, etc., has been purchased. Fred Turner is vice-president and general manager and C. F. Wood is president.

The Louisville & Nashville Railroad Company has purchased a 500 kw. turbo-generator from the Louisville offices of the Westinghouse Electric & Mfg. Company for installation in its South Louisville shops.

The Cockrell Cane Harvesting Company, Louisville, is considering the establishment of a plant here for the manufacture of a new cane harvester, which it is said has been successfully demonstrated. Eustace L. Williams, county courthouse, is one of the officers of the company, which is chartered in Louisiana.

R. E. Wathen & Co., Louisville distillers, will require an electric elevator of 1-ton capacity and a steam heating plant with fan ventilation system for a large warehouse which they are to erect shortly.

Plans for the fish hatchery to be established in Louisville by the Federal Government, provide for the installation of a considerable amount of equipment, including that for a pumping station, transformer, two electric motors of 60 hp. each, with turbo-impeller pumps, steel tank and tower. George Bowers, United States commissioner of fisheries, with offices in Washington, is in charge of the purchase of the equipment.

The Indiana Legislature has approved an appropriation of \$16,000 to be used for the installation of new boilers at the State Reformatory at Jeffersonville, opposite Louisville. D. C. Peyton is superintendent.

The Licking River Power Company, Covington, Ky., has been incorporated with a capital stock of \$5,000, by Francis M. Butler, James B. Cox and S. D. House.

The Louisville & Nashville Railroad Company, Louisville, has announced plans for the establishment of large repair shops at Lexington, Ky., in order to take care of the lines into Eastern Kentucky. The shops will be among the largest owned by the railroad, and will cost, together with other terminal improvements, \$50,000.

W. H. Edward, Jr., road supervisor of Woodford County at Versailles, Ky., will be in charge of the purchase of a new road grader.

The Straight Creek Lumber Company, recently organized at Pineville, Ky., will erect a large sawmill near that city for the manufacture of timber on a large tract recently purchased from coal operators in that section.

The Kentucky Utilities Company, Lexington, Ky., has secured a franchise in Pleasureville, Ky., and will enlarge its Shelbyville, Ky., plant for the purpose of enabling it to serve Pleasureville.

George W. Atkinson, Louisa, Ky., who, as recently reported in *The Iron Age*, has secured a franchise to establish a water plant in Paintsville, Ky., will install two triplex pumps and two 50 hp. gasoline engines.

M. J. Moss, Pineville, Ky., and others have leased 1800 acres of coal land in Harlan county, Ky., and will open a shaft at once. Power conveying and mining equipment will be purchased.

The machine shop of George Montgomery, Greens-

burg, Ind., was destroyed by fire February 19 with a loss of \$10,000. Plans for replacing the shop are being considered.

The Sudekum Packing & Mfg. Company, Nashville, Tenn., has been incorporated with \$50,000 capital stock for the manufacture of metallic packing. John M. Gray, Jr., Charles H. Simpson and Harry Sudekum are the incorporators. A plant will be established in the immediate future.

The Knoxville Smelting & Refining Company, Knoxville, Ky., has been taken over by the Appalachian Development Company and reorganized under the name of the Knoxville Smelting Company with \$150,000 capital stock. T. McMurry has been elected president and general manager. Plans for the erection of a large commercial smelter, with a capacity of 50 tons a day, are under way. The old company confined its attention to testing work.

The Agricultural and Industrial State Normal School, a negro institution at Nashville, Tenn., has equipped a department for manual training. Woodworking machinery has been installed recently at a cost of \$2000, and this will be added to from time to time.

C. F. Kelly, Grand Rapids, Mich., has plans for the erection of a large crating factory at Chattanooga, Tenn.

The Crane Steel Fence Company, Cleveland, Ohio, will erect a plant in North Nashville, Tenn., for the manufacture of woven wire fencing. The plant in Cleveland will be continued, it is reported.

Kenton, Tenn., will let a contract March 11 for the establishment of a water-works and electric light plant. R. C. Huston & Co., Memphis, Tenn., are the engineers in charge.

Bids will be received March 7 by Arlington, Tenn., for the construction and equipment of an electric light plant and water system. R. C. Huston & Co., Memphis, Tenn., have the plans.

Lenoir City, Tenn., will spend \$40,000, to be secured from the sale of bonds recently authorized, in building a water system. Pipe lines will cost \$25,000 and pumps and motors \$3700.

The Athens Table & Mfg. Company, Athens, Tenn., has increased its capital stock to \$50,000 and will enlarge its plant. Woodworking machinery will be needed principally.

The Harris-Ivy Candy Company, Memphis, Tenn., is in the market for refrigerating machinery. R. D. Harris is president.

The Crane Company, Knoxville, Tenn., is reported to be in the market for a 400-lb. steam hammer.

The Currier Lumber Corporation, Imboden, Va., suffered \$30,000 loss by fire at its saw mill. The company will buy machinery at once and rebuild.

The Manchester Board & Paper Company, Richmond, Va., is in the market for two 100 hp. return tubular boilers and equipment for lighting its factory with electricity.

Birmingham

BIRMINGHAM, ALA., February 24, 1913.

Machinery dealers report an unusually heavy volume of business, embracing a great variety of demands. The month of February has been a thoroughly satisfactory one and the prospect is for a continuance of active demand for mill, mining and contractors' supplies.

W. T. Lane and others of the Chipley Gin Company, Chipley, Ga., have purchased the Chipley bottling works and will enlarge it.

The Farmers' Trucking Association, Bay Minette, Ala., is preparing to establish a canning factory with a capital stock of \$8,000 to \$10,000.

The Colbert County Oil & Fertilizer Company, Tusculumbia, Ala., has been organized with a capital stock of \$50,000 to establish a fertilizer mixing plant of 50 tons capacity. J. T. Kirk is president.

The Southern Utilities Company, Kissimmee, Fla., has been incorporated with a capital stock of \$10,000,000. W. B. Crawford is president and Patrick Johnson is secretary. It proposes to operate a gas plant, a hydroelectric plant, etc.

The city of Bessemer, Ala., will spend \$75,000 on an electric lighting plant. The J. B. McCrary Company, Atlanta, Ga., has prepared plans.

The city of Guyton, Ga., is having plans for water and lighting plants prepared by the J. B. McCrary Company, Atlanta, Ga. It will expend \$15,000.

The St. Petersburg Light & Power Company, St. Petersburg, Fla., contemplates establishing a light and power plant to cost \$100,000 or more, construction to

ensue at an early date and the plant to be completed by autumn.

The Centerville Lumber & Mfg. Company, Centerville, Ala., is arranging the establishment of a lumber and manufacturing plant.

The Kentucky Lumber Company, Fayetteville, Ala., has filed articles of incorporation, with a capital stock of \$30,000, to manufacture lumber, by L. W. Patterson and associates.

J. D. McLaughlin, Thomasville, Ga., will establish a lumber plant on a large tract near Coolidge, Ga.

A three-press oil mill will be established at Tusculumbia, Ala., by Colbert County Oil & Fertilizer Company.

J. J. Hurlburt, Lock Haven, Pa., and associates are reported as contemplating the establishment of a large mill for the manufacture of paper of refuse from the extensive plant of the Kaul Lumber Company near Tuscaloosa, Ala. John L. Kaul, Birmingham, Ala., president of Kaul Lumber Company, will be interested if the mill is established.

The National Cast Iron Pipe Company, Birmingham, Ala., is receiving bids for the construction of a water pipe plant at Boyle's near Birmingham at cost of about \$200,000. A. H. Ford, Birmingham, is president; E. E. Linthicum, general manager.

The Panola Light & Power Company, Rockdale, Ga., contemplates enlarging its hydroelectric plant and establishing a steam plant at Lithonia, Ga. It has applied to the State Railroad Commission for the right to increase its capital stock to \$200,000 and issue bonds.

The Anniston Water Supply Company, Anniston, Ala., has been sold by Morris Bush, Birmingham, Arthur Lehman, New York, and Simon H. Stein, Baltimore, to John B. Weakley, W. C. Hamilton and Eugene Fies, of Birmingham. The purchasers also control water plants in Decatur, Ala., and Columbus, Ga.

The Birmingham Railway, Light & Power Company will build a gas holder in Birmingham, Ala. It is to cost \$200,000 and have a capacity of 3,000,000 cu. feet.

The Composite Brick Company, Jacksonville, Fla., has been incorporated with a capital stock of \$150,000. W. J. Carmichael, Willoughby, O., is president. Others interested are: E. B. Wood, Flint, Mich.; C. F. Graves, Jacksonville.

The Pacific Coast

SAN FRANCISCO, CAL., February 18, 1913.

Though good for this time of year, the machine tool market has not yet developed any great activity. Few orders cover more than three or four tools, and no large lists have appeared, though many of the single tools sold are of rather heavy type. One transaction of some importance is said to be practically closed, though no details are given out. Railroad buying is an uncertain factor, the last Southern Pacific order having been placed with the Eccles & Smith Company for a No. 2½ LeBlond motor driven milling machine and two 20x10 LeBlond motor driven lathes.

The general machinery market is gradually taking on more life, the heaviest demand being as before for contractors' equipment and similar lines, including hoisting engines of all descriptions, steam shovels, excavators, air compressors and pneumatic tools, as well as steel cars and portable track. Some of the largest business in such lines is coming from the mining and smelting districts of Arizona, though some large orders are expected from new camps in Nevada, and quarry development is very active in this state. There is more or less figuring on summer requirements for hydroelectric development. A few large steam-electric units are also being placed, but electricity and gas are replacing steam power plants to a very large extent. Cannery business is a prominent feature, and there is a strong demand for laundry machinery. Pump manufacturers are very busy, but from the number of manufacturers engaged in this business there is some apprehension that it may be overdone.

In connection with the new unit of the Southern California Edison Company, at Long Beach, Cal., a contract has been placed with the B. F. Sturtevant Company for a 7000 hp. economizer equipment.

F. B. Wright, Monadnock Building, San Francisco, has just taken the agency for Symons disk crushers, made in Milwaukee.

The Los Angeles branch of the Eccles & Smith Company, machine tools and general machinery, has occupied new quarters at 241-243 South Los Angeles street.

The Dow Pump & Diesel Engine Company has a contract for an elevator pump in the Insurance Ex-

change Building, this city, at \$15,500. The general elevator plant will be installed by the Otis Elevator Company for \$29,500.

The Oro Electric Corporation has placed a contract with Charles C. Moore & Co. to build a steam auxiliary plant near Stockton, Cal., the first unit having a capacity of 1000 kw.

The Eureka Foundry Company, Eureka, Cal., is having built an addition 70 x 80 ft. to its forge shop.

It is reported that work will soon be started on a power plant for the San Joaquin Light & Power Company in Crane Valley, on the upper San Joaquin River. Considerable machinery for timber development will probably be required soon in the same vicinity.

Preliminary work has been completed for an addition to the Standard Oil refinery at El Segundo, Cal.

Plans are under way for a \$10,000 hydroelectric plant at Richardson Springs, near Chico, Cal.

The city of Long Beach, Cal., has taken figures on an air lift pumping outfit.

It is reported that the Union Tool Company will soon establish a branch shop at Brea, Cal.

The Hotpoint Electric Heating Company, Ontario, Cal., is building an addition to its machine shop.

W. N. Beverle is building a machine shop at Phoenix, Ariz.

R. B. McInerney and H. J. Meyer, South Bend, Ind., have been in Phoenix with a view to establishing a foundry there.

A lot of new machinery is being installed at the Madera Brick Works, Madera, Cal.

The Hawaiian Development Company's hardwood mill at Pahoa, T. H., recently burned, will probably be rebuilt in the near future.

The Long Beach Sash & Door Company, Long Beach, Cal., has completed plans for an addition for the manufacture of a building specialty.

The Phoenix Milling Company, Sacramento, Cal., will start work shortly on a new flour and grain mill plant.

Eastern Canada

TORONTO, ONT., February 22, 1913.

If tight money does not make any trouble, Canadian trade and industry will go on making high records. The whole question is whether the purse strings will be closer drawn or slackened. So far all is well, though the banks' last statements show a curtailment of about \$6,000,000 in the amount of commercial discounts. The inflow of capital from Britain and France is not as free as it was. Canadian municipalities cannot get money on such favorable terms in London as they could a year ago, and throughout a period extending several years back from that. In every way the country is advancing, and its consumptive capacity seems to be increased by what it feeds upon—machinery, equipment, and plant of all kinds are in greater demand after a year of large buying on such account. The country has a tremendous margin of growth ahead of it. If there is no money pinch the next twelve months will surpass the last one.

The Star, of Sudbury, Ont., says that the Dominion Nickel & Copper Company will construct a large modern smelter, and that plans are being prepared. The location of the plant will, it is said, be at Murray Mine, near Sudbury.

The Dominion Iron & Steel Company's nail mill at Sydney, N. S., is being enlarged, and is steadily increasing its output. The company has now an up-to-date galvanizing plant in operation. Its wire mill is equipped not only to provide wire for the nail mill and galvanizing plant, but wire for sale as well, including wire already drawn to be made into nails. The new annealing department to supply that part of the wire market is being rapidly pushed to completion. This will absorb a considerable tonnage.

The Canadian Pacific Railway Company is calling for tenders for the construction of a concrete machine shop at McAdam Junction, N. B. The new shops, which will replace the present plant, will be on a larger scale and a more modern type. The change is made necessary by the increase in business.

The ratepayers of Strathroy, Ont., have decided to loan the Royal Motor Car Company \$25,000 to start operations there. London and Strathroy men are interested in the venture. Fifty hands will be employed on the start, increasing to 150 or 200.

T. Davie & Sons, Levis, Que., are building six steel scows for the Dominion Public Works Department, and also a large hopper dredge for the Marine and Fisheries Department.

At a meeting of the directors of the Empire Cotton

Mills, Ltd., at Montreal, plans were passed upon for another new mill. Machinery has been ordered.

Besides the wire nail plant, which is to cost \$200,000, and for which the sanction of the Port Arthur ratepayers has been given, R. Brutinel and associates are considering the erection of works for the manufacture of wire rods there.

At a special meeting of the Town Council of Walkerton, Ont., a by-law guaranteeing the bonds of the Canadian Saddlery, Hardware & Steel Goods Company, Ltd., to the extent of \$8,000, was read a first and second time. The ratepayers will vote on the measure March 10.

The Hydro-Electric Commission, H. J. Glabitz, engineer, is preparing plans and specifications for the installation of new motors and compressors at pumping station No. 1 at London, Ont.

The National Brass Company, Ltd., London, Ont., has been incorporated with a capital stock of \$40,000, and will build a plant for the manufacture of brass goods and plumbers' supplies. John F. Grant and Charles H. Ivey are among the provisional directors.

The Steel Company of Canada has awarded the steel work contract for the erection of boiler shop, blacksmith shop and locomotive crane shelter at its plant in Hamilton, Ont., to the Hamilton Bridge Works.

John Lyle, town clerk, Bowmanville, Ont., is receiving bids for an electric pump, also for valves, hydrants and iron pipe for the new water and sewer systems to be built by the village.

J. B. Laberge & Sons are completing plans for the erection of an extensive door and sash factory and planing mill at Sudbury, Ont. Modern machinery will be installed.

The City Gas Company, London, Ont., J. C. Duffield, manager, will enlarge its plant and distributing system and install new equipment. The approximate expenditure for the extensions and improvements will be \$100,000.

The Standard Steel Construction Company has received a contract from the Canada Forge Company, Ltd., Welland, Ont., for the construction of its new forge plant to replace its plant recently destroyed by fire. A crane runway of 50 ft. span will be installed with one 20 ton and two 5 ton electric cranes. Steam hammers, hydraulic forging presses and annealing and heat treating furnaces will also be installed.

Western Canada

WINNIPEG, MAN., February 21, 1913.

The industrial situation has recently been affected somewhat unfavorably by the financial stringency, which has continued longer than the leading local financial men expected. There is no doubt that many new manufacturing plants and additions to others are delayed by the uncertainty of conditions in the last few weeks. There is, however, a fairly good movement of machinery and parts for different industrial and municipal purposes. Some strong concerns are going ahead with their preparations, regardless of any disappointing features of the monetary situation. Local houses are complaining about the slowness of collections, as it was hoped at the first of the year that a few weeks would bring along a material betterment.

The flour mill and elevator of the Redcliffe Milling Company, Redcliffe, Alberta, which burned recently, will be rebuilt, and it is expected that the new plant will be larger than the one destroyed which was of 50 barrels capacity.

J. F. Diefenbach, of the Northland Milling Company, Larimore, N. D., contemplates erecting a flour mill of 1000 barrels daily capacity at Saskatoon, Sask.; also an elevator of about 60,000 bushels capacity, the whole plant to cost \$100,000.

The Pacific Dredging Company, Portland, Ore., has purchased nine acres at Coquitlam, B. C., and will establish there a dredging plant at a cost of approximately \$500,000. The president of the company is J. L. Davidson.

The Tyee Shale Products Company, Ltd., Victoria, B. C., has recently been organized with a capital stock of \$100,000, to establish a brick and tile manufacturing plant at Coquitlam, B. C.

The Seaman Kent Floor Mfg. Company, Ltd., Fort William, western Ontario, contemplates enlarging its plant this spring. The output last year proved unequal to the demand for the product of the plant.

G. M. Hall, industrial commissioner for Edmonton, Alberta, announces that the Western Canada Flour Mills Company, Ltd., Winnipeg, has bought a site there, presumably to build a plant.

Richard Moss has bought five acres in North Edmonton, Alberta, and will establish there a pork-packing plant. The information comes from the Edmonton industrial commissioner.

The Manitoba Gypsum Company, Winnipeg, has taken over extensive gypsum deposits at Falkland, near Kamloops, B. C., and will erect a plant there that will give employment to more than 100 men.

The Radisson Flour Milling Company has been organized at Radisson, Sas., and a small flour mill and an elevator will be erected there.

It is reported that the Canadian Pacific Railway contemplates building elevators at Calgary and Edmonton, Alberta, each with a capacity of 1,000,000 bushels. The United Farmers of Alberta announce that this will not change their position as regards demands for elevator competition. It is also announced that the Canadian Pacific Railway will proceed without delay to build terminal elevators, wharves, etc., at Pitt River, B. C., to be ready to handle the Canadian grain that is expected to go out by the Pacific coast following the completion of the Panama Canal.

The Scottish Cooperative Society, of which George Fisher is the Winnipeg manager, contemplates building a number of grain elevators in western Canada this year.

The Western Elevator Company, Ltd., Winnipeg, has let a contract for an annex with a capacity of 1,000,000 bushels to its elevator at Fort William, at a cost of about \$400,000.

The wood-working factory of J. M. Bateson, Calgary, Alberta, burned recently, the loss being fully covered by insurance. The plant will be rebuilt.

The Crossing Lumber Company, Ltd., is planning to build a lumber mill at Minaki, western Ontario. The managing director is Frank R. Patriarche.

Preparations are being made for the erection of a large steel bridge over the Athabasca River at Mirror Landing, northwest of Edmonton, Alberta. It will be built by the Edmonton, Dunnegan & British Railway Company, whose line is being constructed from Edmonton into the rich Peace River country.

The Edmonton Portland Cement Company has about four-fifths of the work of constructing its plant at Marlboro, Alberta, completed. The capacity of the plant is to be 1500 barrels per day. The plant is to be in operation in about two months.

Hausplant Bros., Hamilton, Ont., are establishing a small plant at Port Arthur, Ont., for the manufacture of art metal shades.

The Dominion Clay Products Company is the name of a company made up of a number of Indiana men that proposes to spend \$100,000 in building and equipping a plant at Dunmore, near Medicine Hat, Alberta.

In return for the erection by the Farquharson-Gifford Company of a factory 60 x 150 ft., four stories, and valued (with equipment) at \$30,000, for the manufacture of upholstered furniture, the city of Stratford, Ont., if the by-law carries, agrees to guarantee the company's bonds for \$20,000, to provide a free site and fix the assessment at \$10,000.

The B. F. Kastner Company agrees to erect in Stratford, Ont., a four-story \$15,000 factory 40 x 80 ft. for the manufacture of leather mitts and gloves and fur coats, if the by-law passes, providing for the guaranteeing of the company's bond for \$10,000, a free site and a fixed assessment of \$6,000.

The British Columbia Transport Company, Ltd., New Westminster, B. C., will shortly erect a large brick plant, under the name of the Glenburg Brick Works.

Government Purchases

WASHINGTON, D. C., February 24, 1913.

The Bureau of Yards and Docks, Navy Department, Washington, will open bids March 22 for one 200-kw. motor generator set and accessories for delivery to Pearl Harbor, T. H.

The office of the supervising architect, Treasury Department, Washington, will open bids March 19 for the mechanical equipment, except elevators, for the United States post office at Dayton, Ohio.

The Paymaster General, Navy Department, will open bids March 11, under schedule 5198, for one universal milling machine, one toolmakers' engine lathe, one portable electric sensitive bench drill, one motor-driven bench buffing lathe, one motor-driven two-wheel emery bench grinder, one compound-leverage mandrel arbor press and one electroplating outfit for delivery to Boston; schedule 5199, class 11, one three-head adjustable rail motor-driven milling machine for delivery to Norfolk.

The Bureau of Supplies and Accounts, Navy Department, Washington, opened bids February 18 for material and supplies for the Navy Yards as follows:

Schedule 5131: Class 1, one double disk grinder for delivery to Puget Sound—Bidder 9, Charles H. Besly & Co., Chicago, Ill., \$797; 27, Gardner Machine Company, Beloit, Wis., \$611; 43, Manning, Maxwell & Moore, New York, \$797; 45, Prentiss Tool & Supply Company, New York, \$811.62; 59, Fred Ward & Sons, San Francisco, Cal., \$215.

Schedule 5147: Class 22, one inclosed type power-driven air compressor—Bidder 1, American Air Compressor Works, Brooklyn, N. Y., \$688; 8, Bury Compressor Company, Erie, Pa., \$695 and \$737; 14, Chicago Pneumatic Tool Company, New York, \$721 and \$673; 31, Ingersoll-Rand Company, New York, \$736.60; 33, Kemp Machinery Company, Baltimore, Md., \$665 and \$685; 34, Laidlaw, Dunn, Gordon Company, New York, \$680; 53, Sullivan Machinery Company, Chicago, Ill., \$740.

Trade Publications

Metal Slitting Machine.—Blake & Johnson Company, Waterbury, Conn. Circular. Points out the advantages of using a new type of metal slitting machine which was designed with the primary object of changing the cutters in a minimum time. An illustrated description of this machine appeared in *The Iron Age*, November 7, 1912.

Steam Regenerator.—Rateau Steam Regenerator Company, 90 West street, New York City. Pamphlet. Contains considerable useful information on the use of a steam regenerator with reciprocating engines and low-pressure turbines, hoisting and mill engines and in a rail mill. This information is supplemented by diagrams showing the amount of steam available at various periods. A description of the regenerator is included together with a partial list of users.

Valves.—Homestead Valve Company, Pittsburgh, Pa. Circular. Refers to several types of valves which include a blow-off valve made in either brass or iron, an acid valve, a three-way and four-way valve and a straightway valve that is locked in the closed position by an internal locking device located at the top of the plug. Several of these valves are illustrated.

Slate Marking Machines.—Noble & Westbrook Mfg. Company, Hartford, Conn. Pamphlet. Contains illustrations and brief descriptions of the slate marking machines for which this company has recently purchased the manufacturing rights from the Dwight Slate Machine Company. A number of the die designs which this company has made for marking flat surfaces are also shown.

Water Meter.—Alberger Pump & Condenser Company, 140 Cedar street, New York City. Bulletin No. 100. Concerned with the Hammond water meter which is constructed entirely of cast-iron sections bolted together. This meter was designed by an engineer for use under the exacting conditions found in the modern power stations and it is stated that the machine has satisfactorily met all requirements. Among the advantages claimed for the meter are simple and strong construction and ease of access to the various parts for inspection and repairs.

Air Compressor.—Pennsylvania Pneumatic Company, Erie, Pa. Postcard. Concerned with the class SC-1 Barr unit-compound air compressor. The special features claimed for this compressor are a great improvement in design and a marked economy in operation. In addition to the steam-driven type, belt and motor driven units can also be supplied. An illustrated description of the steam-driven compressor appeared in *The Iron Age*, July 18, 1912.

Drill Chuck.—Union Mfg. Co., New Britain, Conn. Folder. Devoted to the New Britain drill chuck, which is a hand-operated, ball bearing, wrenchless device. The special advantages claimed for the chuck are the reduction of friction to a minimum by the use of ball bearings, absence of exposed gears or threads which are apt to become clogged or break and a self-tightening grip. In this connection, it is pointed out that the chuck may be tightened with the thumb and forefinger sufficiently to start drilling and the jaws will tighten their hold upon the drill. An illustration of the chuck and a condensed table of sizes and capacities are included.

Sheet Weight Card.—American Sheet & Tin Plate Company, Frick Building, Pittsburgh. New formed products weight card. Covers standard weight per bundle, number of sheets per bundle, standard weights per square and covering capacities. All sheet roofing products manufactured by this company are stenciled so they may be easily recognized and the trade assured that all sheets are strictly standard and full weight. The galvanized sheets are stenciled Apollo and the black and painted sheets American.

Steam Engines.—Griscom-Russell Company, 90 West street, New York City. Bulletin No. 801. Relates to a line of engines formerly built by the Russell Engine Company. These are of the automatic type and are built with one and four valves. Illustrations of the various engines are included.

Thickness Gauge.—Ashcroft Mfg. Company, 85 Liberty street, New York City. Pamphlet. Shows a thickness gauge which is graduated to read to 0.0005 in. and possesses a range extending from the thinnest tissue paper to material almost 1/4 in. thick. An illustrated description of this gauge appeared in *The Iron Age*, October 31, 1912.

